Equity and Effectiveness in East African Primary Schools

by

Tia Linda Zuze

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ABSTRACT

Researchers and policy makers agree that studying the relationship between school quality and academic achievement will benefit public investment in education. An important turning point in educational delivery in Africa came during the 1990 World Conference on Education for All where renewed commitments to quality basic education were made. Against this background, interest in how African education systems are progressing has increased. This thesis contributes to this understanding in three important ways. The first and broadest objective is to assess the role of comparative studies in setting educational standards. The second relates to how schools within three East African education systems can contribute to the academic success of students whatever their background. The third is to investigate which schools most effectively ensure a meaningful educational experience for children who face economic and social hardships. Data are sourced from the second wave of a cross-national survey of schools in Southern and Eastern Africa. Hierarchical Linear Modelling is used to analyse data on schools and students in Kenya, Tanzania and Uganda.

The results demonstrate that, although valuable for establishing general patterns of effects, comparative studies should be followed by further investigation of the salient issues at work within individual countries. Contrary to earlier studies in developing countries, an unambiguous positive relationship between socioeconomic status and student performance was evident across this region. Compositional, structural and organisational characteristics of East African primary schools were found to be related to academic achievement. Academically supportive relationships between students and household members benefited student performance in Kenya and Tanzania. In line with the school effectiveness theory, resource availability proved to be consistently related to educational quality and its equitable distribution in Uganda. An important finding relating to gender was that characteristics of schools that improved quality did so more effectively for boys than for girls and therefore increased the male academic advantage. The implication is that the climate for learning in East African primary schools is better suited to educating boys.

The study recommends that future surveys pay closer attention to how student attitudes to learning are shaped so that schools can play a more effective role in motivating students. To tease out exactly how the educational environment influences learning, it is also recommended that more longitudinal studies be pursued by the educational research community. That the pace of educational reform is often painfully slow makes the use of longitudinal data to track its course all the more necessary.

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DEDICATION

For my parents Peter Zuze and Gertrude Joyce Zuze for educating me in more ways than they realise, even when the obstacles seemed insurmountable. You awakened in me a passion for excellence and a taste for the impossible. May all children be so lucky.

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1.1 Introduction

This thesis has three important and related purposes. The first is to contribute to the conversation on the role of international assessments in raising educational standards. The second is to understand how African primary schools can be transformed into places of academic excellence for the students that they enrol. The third is to demonstrate how schools can address the needs of groups of students who are at risk of academic failure. Comparing education systems is seen as one way to gain a deeper understanding of the complex relationship between how schools function and how students perform. Because educational policies are unique to each country, their systematic study has presented an excellent opportunity to determine best practices (Darling-Hammond 2007; Heyneman 2003). Interest in comparative studies has grown as decision makers come to recognise the relationship between education quality and economic competitiveness. Cross-national research is especially useful where countries that have similar educational concerns also have strong historical and contemporary ties. Intense controversy surrounds how to undertake comparative studies and what to make of inter-country differences in quality (Baker and LeTendre 2005; Postlethwaite 2006). The context of this thesis will be laid out later in this chapter.

Conditions in African primary schools can be desperate. Many schools are under-resourced and poorly managed. Students from poor homes lack educational support outside of the school, which raises the responsibility of the school to prepare children adequately for their professional lives (Lockheed 1993; Lockheed and Verspoor 1991). Schools struggle with competing alternatives for raising academic standards in primary schools. A unique conceptual framework and multilevel modelling techniques will be used to conduct a systematic study of what factors make some schools more successful than others.

Aside from understanding how to make schools more effective for the student body as a whole, there is also increased interest in addressing glaring inequalities in performance among sub-groups of students who attend the same school. One important area where such disparity exists involves the male gender advantage in mathematics. Gender gaps in mathematics achievement surface as early as primary school and may severely hamper

female career choices later in life. This thesis will contribute to understanding how the educational domain can respond to gender differences in mathematics achievement. This problem is common across many countries at different stages of economic development (Hanna 1989) and certainly remains a serious educational challenge among the three East African countries that are the focus of this study.

Like many less developed countries, primary school education in East Africa has undergone many changes over the years. These changes reflect both local and international events. One policy that has had a dramatic effect on educational delivery is the introduction of Universal Primary Education (UPE). UPE was endorsed internationally at the World Conference on Education in Thailand in 1990 and at a follow-up conference in Senegal ten years later (UNESCO 2000). With the removal of fee structures, education has become more accessible to the very poor. Mass education drives have also exerted unprecedented pressure on the education system. Government expenditure on primary school education has increased dramatically. Governments and local communities have also invested in upgrading school facilities, recruiting teachers and upgrading the skills of staff (Alubisia 2005). Data from Uganda that are used in this thesis were collected two years after the introduction of UPE in that country. Therefore, a further endeavour is to consider which schools coped most effectively under these conditions. I identify how schools differed in educating a socially diverse population and which schools were more effective for students of low socioeconomic status. I explore this particular issue based on Grade 6 literacy test scores because this is a subject where outside support can significantly influence subject mastery and where less affluent students are at a distinct disadvantage (van Steensel 2006; Willms 2004).

The thesis consists of six chapters. The introductory chapter will be followed by a theoretical and empirical framework in Chapter 2, where I review existing literature on school effectiveness. I will also present the conceptual framework and the research questions that guide the remainder of the investigation. Chapter 3 will describe the data and statistical techniques that will be used in the analysis. Data originate from the second wave of the survey of primary schools undertaken by the Southern and Eastern African Consortium for Monitoring Educational Quality (SACMEQ) in 2000. Chapter 3 also covers strategies for conducting comparative analyses and the role that replicated studies play in the world of educational policy. The results of the analysis are reported in two chapters, one of which covers the East African region as a whole and a second that focuses exclusively on Uganda. Chapter 6 presents the overall conclusions and the policy

implications emerging from this thesis. I conclude with suggestions for further work in light of the findings.

1.2 The Role of Education in Development

Improving the quality of education in Africa is recognised as important for many reasons. Human capital theorists concentrate on the economic value of education for development but there are broader issues related to its social value. Both perspectives have merit. Education is central to a country's productivity and growth (Bhorat 2004; Fägerlind and Saha 1989; Hanushek and Wößmann 2007; Harbinson and Myers 1964). There are other gains associated with a highly literate population that touch upon community and national development. Education has been shown to have a positive influence on maternal and child health, on political socialisation, and to be instrumental in improving the status of women in society (Caldwell 1986; Curtis et al. 1993; Hobcraft et al. 1985; Kishor 2000; Kizito 1998; Panel on Transitions to Adulthood in Developing Countries and National Research Council 2005; Sen 1999). More practically, considerable proportions of national budgets are devoted to educational spending, thereby making its quality the business of the general public. Primary level schooling is especially important because it lays the foundation for all further schooling. Tension between whether to invest in higher education or whether to focus on the primary level is ongoing (Psacharopoulos 1989; Psacharopoulos and Patrinos 2004) but rapid growth across many Asian countries has been credited in part at least to sustained investment in high quality free primary education (Deininger 2003).

Policy practitioners disagree about the underlying principle that guides educational delivery. The common view is that strategies designed to improve educational standards are directly opposed to reforms that narrow achievement differences between educationally advantaged and disadvantaged groups (Le Grand 1990; Smith and Lushaus 1995). Consequently either one or the other should be the exclusive focus of reform. Those who support prioritising improved quality maintain that although this will initially favour the elite, only an efficiently functioning system can ever hope to distribute benefits among social groups (Smith and Lushaus 1995). Concerns about equity must necessarily follow the more important question of quality. According to this school of thought, there will be a treacherous trade-off in standards of excellence and by extension economic production if equity targets are pursued. The discourse in favour of equity taking precedence states that the only way to reverse persistent disadvantage is to generate opportunities among the

weakest students even if this requires compromising on efficiency in the short term (Rawls 1999). In the long run society will gain from accessing the skills of all its members (Meuret 2006).

Throughout this thesis I present another take on the relationship between effectiveness and equity; namely, rather than the two being competing goals, the two can actually co-exist and support one another (Lee 2001; Odden 1987; Ross and Zuze 2004; Schaefer 1990; Smith and Lushaus 1995). Therefore a measure of excellence in a schooling system is that it can contribute to general student success while at the same time reducing disparities between learners. Attention to both is absolutely essential in developing countries where challenges of advancing quality and reducing glaring inequalities are inextricably linked.

Contemporary issues facing African schooling systems are tied to complex historical events. Education reforms are often prompted by a political agenda with effects that can be far reaching. The next section traces the educational history of the East African region and explains the reasoning behind the choice of comparator countries in the study.

1.3 International Studies of Education

The first formal attempts to collect educational data in different countries can be traced back to the 1930s. At that stage educational statistics consisted of basic tabulations of staff and student enrolments (Heyneman 1999). Researchers disagreed even then about whether education measures were too contextually specific to compare. Several factors led to the increase of standardised education statistics in ensuing decades. The 1948 Universal Declaration of Human Rights set the scene by recognising that education was a fundamental human right. The formation of UNESCO after the Second World War also played a role because it provided a suitable organisational structure for monitoring educational trends.

Economic factors coincided with historical events in different parts of the world to draw special attention to education quality issues. Newly independent countries faced the challenge of creating an educated workforce to replace colonial administrators. Elsewhere, workforce mobility across the borders of industrialised countries made comparing the quality of educational outputs of economic interest. Increased demand for quality education in developed countries was also spurred on by high birth rates in the baby boom era (Grisay and Griffin 2006). Another contributing factor was a controversial claim about what drove educational inequality. It was asserted that differences in educational quality

stemmed less from schools and more from student family background (Coleman et al. 1966; Peaker 1971) implying that schools could do little to reverse persistent social disadvantage. Such studies inspired spirited debates designed to reassert the explanatory strength of school variables on academic development in different contexts (Heyneman and Loxley 1983). More recently, renewed commitments to free primary education have added further momentum to comparing schooling systems in terms of quality, equity and access (UNESCO 2000; UNESCO 2005a). The demand for reliable educational statistics has become widespread.

The first attempts to fill this void were studies conducted by the International Association for the Evaluation of Educational Achievement (IEA) in the 1960s with curriculum based mathematics and science tests. The First International Mathematics Study (FIMS) was carried out in 1967 and the First International Science Study (FISS) followed in 1971. Further cycles of mathematics and science studies were conducted in the 1980s and 1990s and a reading literacy assessment known as the Progress in International Reading Literacy Study (PIRLS) was introduced in 1999 (Grisay and Griffin 2006). The Organisation for Economic Co-operation and Development (OECD) introduced the Programme for International Student Assessment (PISA) in 2000 (OECD 2001). Unlike the IEA studies that were curriculum-based, PISA targets 15-year old students in participating countries and focuses on the application of what they have learned to real life situations. Several non-OECD countries have taken part in more recent waves of PISA. The design of the SACMEQ survey is more in line with the IEA studies although an added component of capacity building means that ministerial involvement and national policy priorities are integral to the survey design[1]. I will review the origins and scope of the SACMEQ programme in Chapter 3.

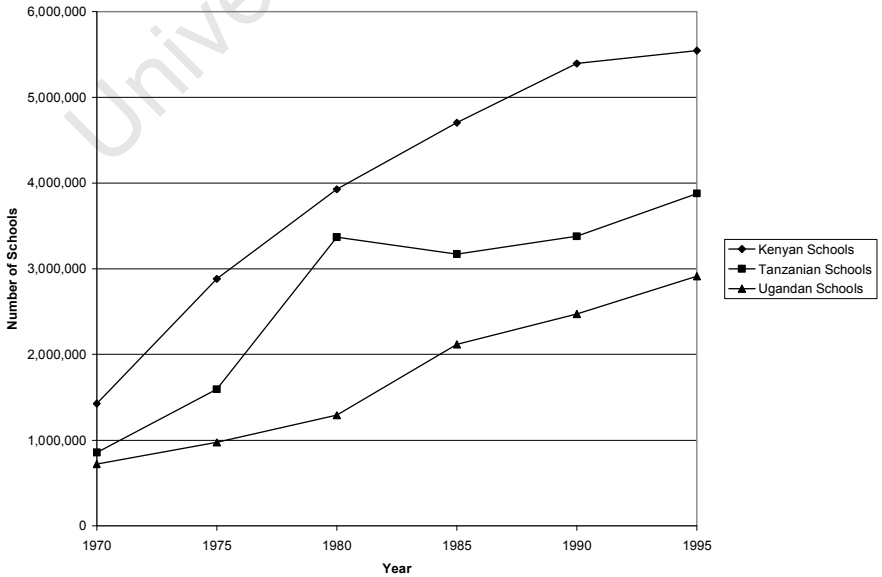
1.4 The East African Education Scene: Motivating Country Selection

There are a number of historical ties that bind the educational pathways of Kenya, Tanzania and Uganda. They each formed part of the British East African Protectorate during the colonial era which meant that the education of Africans was quite literally directed by the same colonial policy. Across the region, Western-style education was introduced by Christian missionaries before colonial governments took over. From the missionary's perspective, reading and writing were necessary pre-requisites for conversion

to Christianity (Scanlon 1964). Recommendations from the 1924 Phelps-Stokes Commission Report and the 1925 British White Paper on Education in Tropical Africa were applied across the region. These reports resulted in more government control over education and reduced education for Africans to little more than basic literacy, agricultural studies and community development (Bogonko 1992). During this period, separate advisory committees for colonial education were established for Africans, Europeans, Arabs and Asians with different curricula based upon the perceived contributions of each population group to colonial development. Legislation introduced in the 1920s and 1930s was at pains to emphasise what was believed to be the intellectual limitations of Africans and the pragmatism of an uncomplicated curriculum (Brett 1996; Raju 1973). Africans were encouraged to develop skills that would be useful within their immediate environments and the colonial leadership consistently denied Africans the right to an equal quality of education (Sheffield 1973).

Leaders of newly independent countries recognised that expanding educational access was an important rallying point to show that they were breaking from the past. Figure 1.1 shows how the decade after independence in the 1960s saw an unprecedented increase in the number of primary schools, particularly in Kenya and Tanzania. From a logistical perspective, because there was only one university in East Africa at the time of independence[2], there was a practical need attached to integrating all three education systems.

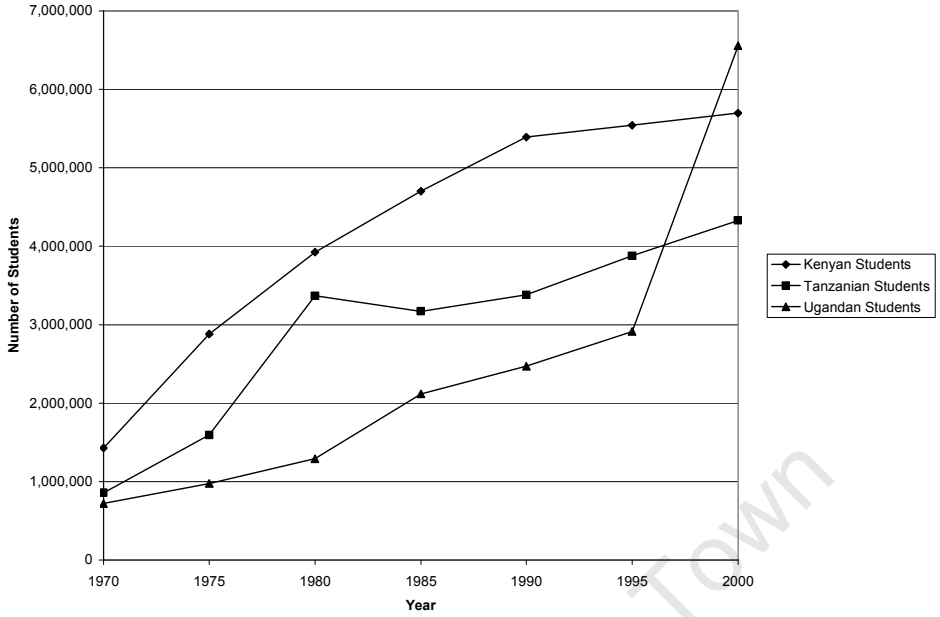
Figure 1.1: Growth of East African Schools



Source: (UNESCO 1999; UNESCO 2005b)

Skilled workers were also desperately needed to support economic development. Perhaps more indirectly, education was recognised as an important vehicle for building a national identity. Each country faced the challenge of expanding learning opportunities; especially among marginalised groups (Bogonko 1992). National governments in Kenya and Tanzania honoured their obligations to education reform by making bold commitments to free primary education (Oketch and Rolleston 2007). In Uganda, free primary education was alluded to in the Third Five Year Development Plan (1972-1976) and the later Education Policy Review Commission (1977) but was only formalised decades after independence. Sudden increases in student enrolments in Figure 1.2 coincide with free education commitments (1974 and 1979 in Kenya, 1974 in Tanzania and 1997 in Uganda). On the whole, there were considerable improvements in opportunities to learn compared to the system that was inherited from colonial administrators.

Figure 1.2: Growth of East African Student Population



Source: (UNESCO 1999; UNESCO 2005b)

A combination of internal and external events reversed many of the gains made immediately after independence. Internally, government mismanagement of national resource wealth reduced productivity and economic growth. Externally, global economic crises, such the OPEC oil crisis of the 1970s and high interest rates increased the debt burden owed to industrialised countries by developing nations. International organisations such as the World Bank and International Monitory Fund (IMF) recommended a series of economic reforms intended to reverse government involvement in economic management and to create attractive conditions for private sector investment. These reforms became known as Structural Adjustment Programmes (SAPs) and were introduced in more than half of the countries of sub-Saharan Africa during the 1980s and 1990s (SAPRIN 2004). While it is generally accepted that urgent economic reforms were needed in Africa, an international chorus of criticism against the effect of SAPs on the most vulnerable groups continues to grow. For education, user fees for primary education were introduced and enrolments fell, particularly among girls and children from poor homes (Brett 1996; Raikes and Gibbon 1996; SAPRIN 2004). Communities became the life-lines of the education system and opportunities for marginalised groups to access schools quickly faded (Alubisia 2005).

There are also internal and external influences that have affected recent efforts at reform. Governments' renewed commitment to UPE has been likened to the period after independence because of its political dimension. This time it has coincided not with the end of a colonial legacy but with shifts in political processes. Driven by a desire to secure votes in highly contested electoral campaigns, politicians in the region have made public (and sometimes hasty) pledges to free education (Stasavage 2005). Support for mass education has an international flavour as well and many of the international agencies that previously insisted on user fees and budget cuts to education are actively financing UPE programmes. The focus of this thesis is not the sustainability of educational reforms but I have chosen to highlight this point as a reminder of how the functioning of schools is affected by broader trends. Political interests aside, there is now renewed interest in raising educational quality and improving its distribution.

The region has also grown closer in terms of economic co-operation. All three countries are members of the East African Community (EAC)[3] that is tasked with improving regional integration. Its leaders recognise that part of creating a competitive economic community is developing the region's human resource base and increasing workforce mobility across borders. Harmonising the educational and training standards across the region is another important step in the process. In the following sections, I describe the conditions of schooling in East Africa from the colonial period up to 2000 when data used in this thesis were collected. It is followed by a comparison of social indicators across the three countries.

1.4.1 Kenya

Education in the Colonial Era

The spread of missionary education in Kenya only really began after Kenya was declared a British protectorate in 1895. The British carved out railroad networks that cut across the country and made movement easier. Missionaries initially devoted their time and energy to educating freed slaves but the focus quickly shifted to training Africans to support colonial interests (Eshiwani 1990; Sheffield 1973). As elsewhere in colonial Africa, education departments in Kenya were segregated according to race (Black, White, Arab and Asian) with the majority of education resources allocated to white schools. In response to the lack of educational opportunities, Africans took it upon themselves to establish independent schools, through organisations like the Kikuyu Independent Schools' Association. These groups would later form the basis of a powerful community school movement. A series of hurdles stood between an African child and a quality education.

Less than 20 per cent of African students passed the Common Entrance Examination at Grade 4 only to face a Primary School Leaving Examination at Grade 7. The process of filtering candidates continued through secondary school. Only a handful of students would successfully pass the Cambridge Higher School Certificate and earn a place at Makerere College, the only higher education institution for Africans. Successful candidates included many of Kenya's most influential leaders (Gatheru 2005).

Education after Independence:

Kenya gained independence in 1963. Early years of independences were characterised by economic prosperity and heavy investment in education. A major challenge to education at independence was expanding access and increasing the relevance of the curriculum (Abagi 1994). During the 1960s and 1970s the Kenyan government adopted a 'New Primary Approach' to primary school education to transform education delivery. The Kenya Institute of Education (KIE) played a central role in redesigning the school system, spear-heading curriculum development, teacher training, and the production of educational materials (Sheffield 1973). Interestingly, whereas some authors have praised the foundations laid by Kenya's first independent government (Bradshaw and Fuller 1996), others have questioned whether they planned sufficiently for the future. Buchman (1999) is especially critical of what she describes as a mismatch between education provision and labour market demand. In her view, government allowed the education system to expand unchecked with little regard for the skills necessary for economic development.

One of the unique aspects of Kenya's expanding education system was the Harambee[4] school movement. It had its roots in the independent schools created before independence in defiance of the type of schooling offered to Africans. Through this scheme, government encouraged local communities to construct and manage their own (mainly secondary) schools. Harambee schooling was popular among politicians because it gave the impression that the education system could rely on grass-roots support to expand without massive inputs from the state. Because the system expanded relatively unchecked, the quality of these schools varied considerably depending on where they were situated (Buchmann 1999). The quality of education at Harambee schools generally lagged behind government-owned institutions. Female students and students from poor, rural locations were more likely to enrol in Harambee schools than in mainstream schools (Bradshaw and Fuller 1996; Mwiria 1990).

Efforts by government to expand educational access included abolishing school fees in 1974 (for Grades 1 to 4) and 1979 (for Grades 5 to 7) but this was met with fierce opposition from school administrators (Amutabi 2003). Some schools reacted by demanding private contributions from parents. For example, building levies were introduced which were, at times higher than the original school fees (Oketch 2006). A short-lived school milk programme was also introduced in 1979 (Mukudi 2004). Free milk was provided to students who were attending state-owned schools. No doubt the scheme shored up enrolments but this came at the expense of other educational inputs such as books and stationery (Amutabi 2003). To meet the increased demand for teachers, government lowered the requirements for hiring teaching staff in the country's primary schools. The increase in the number of untrained teachers has been blamed for the lower pass rates in Kenya's primary leaving examinations in the late 1970s (Amutabi 2003). By the early 1980s, the education system was plagued by high enrolment, untrained teachers, overstretched resources and faltering quality.

Government responded to this education crisis by restructuring the education system in 1985. Previously, it was based on the British model of 7 years of primary school, upto 6 years of secondary school and 3 years of university. The new structure consisted of 8 years of primary school, 4 years of secondary school and 4 years of tertiary training. It was anticipated that the new curriculum, with its focus on continuous assessment and vocational training, would put an end to the examination driven learning. Policy makers also expected that including technical training in the curriculum would see better absorption of students into the labour market. Ministry officials also argued that diversifying the curriculum would improve educational opportunities for girls. To their credit, the Kenyan government addressed the problem of untrained teachers by instituting several teacher training colleges. Once again poor planning overshadowed these good intentions. Over-recruitment led to a massive surplus of teachers graduating from Kenya's teacher training colleges who could not be added to the government payroll. Many left Kenya to work in other African countries (Commonwealth Secretarit 2005).

Coinciding with these reforms, cost sharing was re-introduced in 1987 meaning that the burden of implementing the new curriculum (hiring additional teachers, building extra classrooms and workshops) was passed onto parents and communities (Abagi 1994). The 8-4-4 system has been heavily criticised for being poorly planned and unrealistic. Some have argued that the scope of the curriculum was so vast that it actually encouraged rote

learning and forced staff to teach exclusively for examination purposes (Abagi 1994; Amutabi 2003).

Government continued to politicise education in this period. Rallies to raise money for Harambee schools were used by government officials to pursue electoral support (Bradshaw and Fuller 1996). It was not uncommon to find politicians competing with each other to have schools named after them (Amutabi 2003). The system was further corrupted when, desperate for revenue, competitive government schools admitted weak students from Harambee schools on a higher fee structure, thereby creating a vicious system of back door entrance to good schools. Increasingly, ethnic affiliation was the determining factor for educational support. The combined effect of rapid population growth, ethnic divisions and rampant government corruption eroded the early progress that had been achieved in Kenya.

Education in the 1990s

Owing to increases in private costs for schooling during the 1990s, the net primary enrolment rates declined rapidly and in 2000, only 70 per cent of children in the official age group were in primary school (Onsomu et al. 2005). Kenya's population growth rate was also one of the highest in the world in the 1970s and 80s (Cross et al. 1991) and with the majority of the population under age 20, a great strain was imposed on the education infrastructure (Eshiwani 1990). In 1993, Kenya implemented structural adjustment programmes in conjunction with the World Bank and IMF. The programmes involved a tighter fiscal and monetary policy, privatisation of state run companies and the streamlining of the civil service. These measures contributed to improvements in growth in the mid-1990s. The country has experienced a respectable economic rebound since 2000 and free primary education was introduced in 2003. As in times past, this renewed commitment has been criticised for being politically motivated and poorly planned (Mukudi 2004).

The challenge of expanding educational benefits persists and the presence of political patronage at all levels further complicates the situation. Efforts at improving educational opportunities for underserved groups such as girls are hindered in some areas. Early marriage for girls is still popular in parts of the country especially in the predominantly Muslim North East. Another widespread problem facing the Kenyan education system is teacher wastage. Efforts at training teachers are offset by a constant exodus of teachers to other economic sectors (Eshiwani 1990). Competitive school leaving examinations continue to dominate the education landscape at both the primary and secondary school

levels. So rampant is pressure to attend the best primary and secondary schools that it has been reported to influence parental pre-school selection. According Buchmann (1999) attending the right pre-schools has become a valuable pre-requisite for admission to competitive primary schools.

Kenya's education system has experienced numerous changes in the decades following independence. Early priorities such as expanded access and building national identity were replaced by periods of reform that were intended to increase educational opportunities and the likelihood of future employment. The timing of educational directives had a distinct political flavour. In extreme cases decisions were influenced by the ethnic affiliations of the existing leadership. Kenya's educational reform took place amidst declining economic conditions and an increasing population and this had some bearing on their success. In spite of efforts to diversify the curriculum and increase its relevance, Kenya's education system has on-the-whole remained highly traditional and certificate-oriented (Eshiwani 1990). Perhaps the enduring lesson from Kenya's educational history thus far is that a competitive exam-based education system that uses a complicated curriculum can certainly produce pockets of excellence but it does so by exerting tremendous pressure on educational resources. Symptoms of this strain in Kenyan schools are seen in widespread repetition practises, high staff turnover and overcrowded classrooms (Alubisia 2005). In such an environment quality has come at a great cost to internal efficiency[5].

1.4.2 Tanzania

Education in the Colonial Era

Tanzania was occupied by Germany from 1885 up until the end of the First World War and under German control, non-religious government schools were built in the central and coastal regions. In a similar vein to Kenya and Uganda, missionary schools increased their numbers by directly targeting former slaves. After the war, the territory came under British control and the education of Africans was brought in line with Britain's colonial policies in East Africa. Because the settler population in Kenya tended to be more influential, Tanzania remained less economically developed in terms of infrastructure and investments (Galabawa 1990). Most students in Tanganyika as it was then known came from Arab and Indian communities. As elsewhere in Africa, government schools began to welcome children of local chiefs who in return supported the colonial administration (Buchert 1994).

Education after Independence:

The territories of Tanganyika and Zanzibar gained independence in 1961 and 1963 respectively. They united to form present day Tanzania in 1964[6] and Julius Nyerere became the country's first president. In the wake of independence, Tanzania's socialist outlook (Ujamaa) emphasised rural development and self-reliance or 'Kujitegemea'. The 1967 Arusha Declaration determined that the equitable distribution of basic social services would be achieved by moving the population into large villages; a process that has come to be known as villagisation. The Arusha Declaration also introduced a nationalisation policy for local industries. The rationale was that Tanzania's resource wealth would be more effectively re-invested in the country if companies were state-owned but it often increased inefficiency and corruption. These policies have been largely blamed for Tanzania's subsequent economic crisis.

Tanzania's first Five Year Development Plan focused attention on higher education (Galabawa 1990) but by 1977, there were moves to make primary education free. It has been reported that the campaign resulted in gross primary school enrolment of nearly 100 per cent in the 1980s (Mrutu et al. 2005; Rajani 2003) far above levels in sub-Saharan Africa at the time. Teacher training colleges were combined so that resources could be concentrated on upgrading a few key institutions. Students were expected to remain in rural areas and to contribute to its development. Therefore it was understood that primary schooling was intended as a preparation for a rural life and rarely a stepping stone to further education (Galabawa 1990). The cultivation of crops on school farms was an integral part of school activities (Urch 1992) and Kiswahili was the language of instruction. In 1974, the Musoma Resolution extended the idea of social responsibility by requiring students to perform two years of community service prior to admission at university. Reports by employers formed part of the university admission criteria. This was intended to reduce the dependency on examinations for academic progress (Galabawa 1990).

Nyerere's educational philosophy was not without its critics. In some quarters it has been blamed for eroding the quality of primary education in Tanzania. In fact UPE was commonly referred to as 'Ualimu Pasipo Elimu' which translates from the Swahili to mean 'teaching without education' (Wedgwood 2007). The notion of 'self-reliance' was regularly abused by teachers who sometimes treated students as a personal source of labour (Rajani 2001).

Education in the 1990s

With time the strain of supporting an ever expanding education system amidst economic decline began to take its toll. Because of the economic failure of villagisation and state control of agriculture, productivity fell far below its potential. Tanzania was not immune from the international economic decline of the 1970s and this was compounded by the costs of a 1978-79 war with Uganda. To stabilise the economy, the international community put pressure on the government to accept structural adjustment reforms that included trade liberalisation, the devaluation of the Tanzanian currency and agricultural reforms (Raikes and Gibbon 1996). According to its advocates, any government spending, including spending on social services such as health and education was tantamount to state interference in the economy and would ultimately lead to economic inefficiency. Free education and hospital care were replaced by cost sharing measures.

International experts were of the view that introducing user fees would encourage a sense of ownership among parents and local communities. Ironically, it achieved quite the opposite leading to a widespread belief that government was either unwilling or unable to support the educational needs of the poor. Primary school enrolment plummeted in the 1990s. Female participation rates were especially affected at this time, particularly at the secondary school level (Buchert 1994). As real incomes continued to decline and doubts about the benefits of education became more widespread, many parents encouraged their children to substitute work for time wasted in a faltering education system (IMF 2006). The deteriorating economic conditions also encouraged other practices like early marriage of girls because parents would receive a bride price in exchange for marrying off their daughters (Mlama 2000).

Tanzania has made small but significant steps towards economic growth and recovery, more so in the agricultural sector (Raikes and Gibbon 1996). Government has developed a 'Primary Education Development Programme' designed to improve teacher quality and student outcomes (Nkumbi et al. 2006). Research into gender issues in education has received international support in Tanzania. In 1995, a Gender Co-ordinating Committee was created within the Ministry of Education and has been active in improving learning conditions for girls from poor communities (Colclough et al. 2003). Tanzania remains one of the poorest countries in the world and heavily dependent on donor grants for its economic survival. Like her neighbours, in Tanzania the recent introduction of free primary education (in 2001) resulted in an upsurge in enrolment from 4.8 million in 2001 to 6 million in 2001.

In sum, success in expanding enrolment was short-lived and schooling conditions declined in the long-run. A legacy of low enrolment, dilapidated buildings, crowded classroom conditions and inadequate teaching staff are among the main challenges to educational quality in Tanzania. For decades schooling was considered complete at the end of primary school. Automatic promotion through primary school was a stark contrast to the exam-driven climate in Kenyan schools. Even recently, opportunities for secondary schooling are so scarce that a sense of futility permeates many schooling environments. Concerns about excessive use of corporal punishment and forced labour have been raised (Rajani 2001). So desperate is the learning environment that teaching has been described by one author as "a practice in riot control…rather than a process of interaction and learning" (Rajani 2003, p.60). The Tanzanian school system consists of 7 years of primary school, 6 years of secondary school and 3 years of university.

In both Kenya and Tanzania, developments in education were largely dominated by the cult of personality surrounding their post-independence leaders. Their ideological outlooks may have differed but for better or worse, these leaders have played a dominant role in formulating and delivering educational policy. This was less of a case in Uganda. In fact, the series of events that have shaped Uganda's educational history are quite unparalleled.

1.4.3 Uganda

Education in the Colonial Era

Uganda's experience under British control is an excellent example of rule by means of inciting divisions among local groups. The British nurtured favourable relations with the Buganda kingdom that were to haunt Uganda for many years (Arnold 2005). In exchange for British support in quashing rival kingdoms, the Baganda offered their services to the British as low-ranking officials. With the aid of Christian missionaries, many schools were built especially in Buganda areas where children of the elite were educated. Perhaps more so than in Kenya or Tanzania, the missionary influence on education was to remain firmly in place until independence.

Education after Independence

Uganda became independent in 1962, with Milton Obote as its first president. Opposed to Uganda's monarchies, Obote sought to reverse the dominance of the Baganda and establish a socialist state (Arnold 2005). Uganda's early commitment to primary education was perhaps less vigorous than her two neighbours. According to Oketch (2006), at independence in 1962, budgetary allocations to education lagged far behind Tanzania and Kenya. In 1962, there were only 500,000 students enrolled in Ugandan primary schools (Chesswas 1966; Government of Uganda 1999). The 1963 Castle Commission was the first major effort by the new government to expand the education system. Policy makers in Uganda placed heavy emphasis on secondary and tertiary level institutions because this was widely believed to be the most efficient way to meet the country's developmental goals. Budget allocation to primary schooling tended to fade into the background.

A series of internal and external shocks were to rock Uganda to its core and to halt progress in educational development. These disturbances included political strife, fluctuating commodity prices, mounting debt and involvement in regional conflicts. Ethnic tension during the rule of President Obote (Uganda's first president) was replaced by an even worse situation when the violent rule of General Idi Amin began in 1971. Amin remained in power until he was overthrown in 1979. During his rule, Asians were expelled from the country (many of whom ran prosperous businesses), mass murder was carried out and the economy was run into the ground. Many teachers were drawn into the turmoil and some died (Mushemeza 2003).

The educational infrastructure was severely damaged by two decades of instability. Instructional materials became scarce, teacher morale plummeted and many teachers left the country. The number of teaching staff fluctuated dramatically in the 1990s. Were it not for relentless community support, the education system would have experienced complete collapse (Appleton 2001; Nishimura et al. 2007). Like its neighbours, Uganda was subjected to the World Bank Structural Adjustment Programmes in the 1980s. Unsurprisingly massive cuts in social sector spending were carried out and included education. A dismal 1.2 percent of GDP was spent on education in the 1980s (World Bank 2002).

Education in the 1990s

In spite of these devastating events, Uganda has made notable economic advances in the last decade and there has been visible improvement of the country's infrastructure. In

the late 1980s the Ugandan government introduced a series of fresh education innovations including an Education Policy Review Commission in 1987 that recommended the introduction of UPE. Uganda was the first of the three countries to introduce UPE in 1997 and the only one of the three to have the policy in place at the time that data used in this thesis were collected in 2000. Initially, the policy provided for a maximum of four school children from each household to attend school of whom two were to be girls. In 2003, this was revised to cover all children (Alubisia 2005). School uniforms were made optional although many teachers insisted on them so that socioeconomic difference among children from different background would be less noticeable. Government became responsible for school fees and also undertook to provide instructional materials. The training and remuneration of teachers was also the responsibility of government. Although government provided the raw material for the construction of physical facilities, communities were expected to make a contribution to the construction and maintenance of school facilities by supplying the labour (Government of Uganda 1999; World Bank 2002).

Decision making has been systematically transferred to district councils and to school management committees as part of integrated efforts to improve the administration of the UPE system. The rationale for decentralising responsibility is that it allows the central ministry to concentrate on policy and planning issues. District officials are responsible for teacher recruitment, for the allocation of government grants and for the distribution of learning materials. They are also responsible for maintaining up-to-date records for the Education Management Information System (World Bank 2002). The cost of free-primary education was largely serviced by external aid and by funds made available by the cancellation of a portion of Uganda's external debt[7]. Notably, budget allocations to education increased by 25 per cent in the five years leading up to the official introduction of UPE and the proportion of the education budget allocated to primary education rose by over 15 per cent (Government of Uganda 1999).

The introduction of free primary education led to an unprecedented increase in enrolment. From 1997 to 2002, enrolment rose from 2.7 million students to over 7 million students. Newly enrolled students mostly came from marginalised groups especially girls and students from low-income families (Deininger 2003). At the higher grades of primary schools, the beneficiaries also included students who had dropped out because of cost constraints. The majority of the students who re-enrolled at higher grades were boys (Appleton 2001). A media campaign was used to encourage female enrolments. Nonetheless, girls still underperformed in schools, especially in mathematics and science

subjects. Functional literacy rates for men compared to women were 76 per cent and 61 per cent respectively. Social barriers and insufficient career counselling still lead to higher dropout rates and early marriages among girls (Government of Uganda 2005). According to one World Bank study (World Bank 2006), the enrolment of girls still lagged behind by as much as 15 per cent in the 1990s and the performance of girls in mathematics remained poor.

Predictably, the advent of UPE was accompanied by the shock of accommodating a large number students within the education system. Teacher shortages, overcrowded classrooms, absenteeism, repetition, and multiple shift schooling were among the symptoms of the overwhelmed system. It has been reported that the pupil-teacher ratios were among the highest in the world after the declaration of UPE, increasing by over 80 per cent in some regions (Deininger 2003). Pupil-textbook ratios also suffered. The textbook situation was further worsened by curriculum reform in 2000, which made existing textbooks obsolete (Oketch and Rolleston 2007). Reports on grade completion rates after UPE was introduced reveal conflicting positions. Some studies claim high levels of drop-out (Cameron 2005; Forum for African Women Educationalists 2006) while others maintain that there have been remarkable improvements in students completing the primary school cycle (Mikiko et al. 2008).

In Uganda, community support has been instrumental in cushioning the shock of strained resources and in maintaining the infrastructure of schools (Deininger 2003; Government of Uganda 1999; Oketch and Rolleston 2007). The introduction of a Teacher Development and Management System (TDMS) is another important strategy that has been introduced to accommodate the changes brought about by UPE. The system supports teacher professional development and encourages the creation of new instructional materials. A unique method of financial transparency is practiced in Uganda. Because district officers are responsible for the distribution of funds to schools, government publishes the amounts allocated to districts in the national press and also makes known to the public the formula used to derive these amounts (World Bank 2002).

Uganda's 'big bang' approach to improved access has been criticised in some quarters for being poorly planned and for overwhelming the education system. The strain on quality has been quite apparent, given the dramatic increase in failure rates among students writing primary leaving examinations. The obvious compromise in quality has led some authors to question whether initially at least Uganda's attempt at UPE merely reduced private costs while dramatically raising the social costs of schooling:

> Although the out-of-pocket costs of primary schooling have decreased…one consequence of the increased inflow of students into the system was a reduction of quality. It is thus impossible to reject the hypothesis that, in quality-adjusted terms, there has been little change in the cost of primary education. (Deininger 2003, p.303)

In many ways, Uganda was a pioneer for free primary education and experiences drawn from there are surely a harbinger of what would follow elsewhere. I devote a chapter to examining conditions in Uganda because it is a valuable opportunity to examine the early effects of free primary education on the quality of learning. Like Tanzania, the Ugandan primary schools cycle is 7 years and is followed by 6 years of secondary school and 2 to 5 years of tertiary education.

1.5 Social Indicators

Social indicators for the region are shown in Table 1.1. The table reveals broad socio-economic similarities between the three countries. Kenya, Tanzania and Uganda are chiefly rural and agrarian economies that rely heavily on the export of primary products. At least two thirds of each country's population live in rural areas. The countries' main exports include tea, coffee, cotton and gold (in Tanzania and Uganda). Tourism is an increasingly important sector of the economy. Kiswahili is widely spoken across East Africa, but is more common in Tanzania and Kenya than it is in Uganda. The SACMEQ II survey was carried out in Kiswahili in Tanzania and in English in Kenya and Uganda. Although estimates of national population size were smallest in Uganda in 2000, nearly half of the population was under the age of 15.

At the turn of the century Tanzania was clearly the least economically advantaged of the three study areas, with a per capita GDP far below the average for sub-Saharan Africa. Tanzania also had the largest population. Overall, Kenya was the most urbanised and advanced setting, enjoying a higher human development ranking[8], highly literate adult population, a lower infant mortality rate and a slower population growth rate. However, during this period, the impact of HIV on the adult population was considerably higher in Kenya than in either Tanzania or Uganda. Interestingly, life expectancy was lowest in Uganda, a likely indicator of the extent to which HIV/AIDS had ravaged the country in previous years.

Table 1.1: Social Indicators

Indicator	Kenya	Tanzania	Uganda	Sub-Saharan Africa
Population (000)	30.7	35.1	23.3	303
Percentage under 15	43.5	32.3	49.2	44.6
Percentage Urban	33.4	32.3	14.2	33.9
Per Capita GDP (PPP US$)	1,022	523	1,208	1,690
Life Expectancy at Birth (years)	50.8	51.1	44.0	48.7
Human Development Index Rank [b]	134	151	150	-
Infant Mortality Rate (per 1,000 live births)	77	104	110	107
Percentage of Population Using Improved Water Sources	49	54	50	54
Adults Living with HIV/AIDS [a]	15.01	7.83	5.0	9.0
Adult Literacy Rate	82.4	75.1	67.1	61.5
Ratio of Pupils to Teachers at the Primary Level[c]	34.4	41.4	52.7	-
Total Spending on Education as a Percentage of GDP[c]	6.3	2.2	2.5	-
Net Enrolment Ratio[c]	66.3	51.4	89[d]	-

Source: (UNDP 2002)

a. 2001 estimate
b. 2002 rank
c. World Bank Education Statistics
d. (World Bank 2006)

1.6 Concluding Comments

The aim of this thesis is to understand which characteristics of schools influence the level of mastery reached by students in East African primary schools. Although I consider the effect of schooling on general educational standards in primary school, I am equally interested in how schools can better serve disadvantaged students. From my discussion of the region's education history it becomes quite apparent that though their political paths may have diverged at times (and sometimes even clashed) a strong level of commonality still remains. First, in each country, various factors eroded the educational gains achieved shortly after independence. Second, they continue to maintain firm social, economic and cultural links. Third, they are confronted with finding ways to improve the delivery of quality state schooling. Recently their educational goals have drawn even closer under united calls for Education for All (EFA) making a comparison of their educational systems both necessary and informative. It appears that if there were ever a rationale for cross-country comparison of education, this region would surely offer a good point of departure. In one country, Uganda, a further exploration of the initial impact of the policy of free primary education on the social distribution of learning is made possible because data were collected three years after its implementation.

The above review also discussed how instrumental local and international conditions have been to moulding the countries' education systems. Global events are inextricably coloured by a very complex domestic situation and the interplay between political and ethnic interests. The ongoing tension between modernity and traditional values, the often politicised importance of language and cultural identity and the transient nature of educational policy combine to create multiple explanations for the effectiveness and equity in primary schooling. I have tried to provide enough detail to serve as a context for an empirical comparison of effectiveness and equity in the three countries. In the next chapter I move onto an extensive literature review of school effectiveness with special attention to studies in developing countries.

CHAPTER 2:
THEORETICAL AND EMPIRCAL BACKGROUND

2.1 Introduction

Children in developing countries face many challenges in achieving their educational goals. Students who live in poverty-stricken areas with limited educational support are enrolled in under-resourced and poorly managed schools. They must somehow overcome these hurdles, remain in school and perform well enough at competitive school-leaving examinations to earn the right of passage to a better way of life. Compared to industrialised countries, students in developing countries spend less time in school, receive instruction from less qualified teachers, are exposed to more overcrowded conditions and are guided by less structured curricula (Lockheed 1993; Lockheed and Verspoor 1991). Poor living standards add to the complex reality of education in Africa. Even though guaranteed access to education in a government primary school is now commonplace in many African countries, the likelihood of low academic achievement, drop-out and repetition remains high among children from low-income households.

Mass education policies have raised difficult questions about how to accommodate additional students within schooling systems that are already strained to capacity (Deininger 2003; Mosha 1988; Ross 2007; UNESCO 2006). The worst consequences of low quality schooling are often borne by the children that these policies were originally designed to protect (Hanushek 1995; Lockheed and Levin 1993). Students from less favourable home environments face greater academic challenges. There are added demands on children's time and a notable absence of adult academic support. Similar anomalies exist depending on the gender of students. Girls face particular difficulties in their academic pursuits because of doubts about whether there is even a need to educate them. Invariably, the school environment mirrors the society in which it is found.

In spite of the extra effort required to educate children who are at higher risk of failure, some schools manage to do so successfully. In such schools, not only are educational standards generally high, but achievement differences between students of different backgrounds are reduced. Trying to understand what has enabled certain schools to achieve better and more equitably distributed academic results led to the popularity of school effectiveness research (Reynolds et al. 2000). Although this type of research is still relatively new in developing countries, existing evidence has shown that there are specific characteristics of schools that promote effectiveness and equity in student academic achievement. School resources have been singled out as especially important in explaining

differences in performance among schools in developing countries. The strength of this finding is not limited to school facilities, but applies to the importance of human and instructional resources as well (Heyneman et al. 1981; Lockheed and Verspoor 1991). These results are not without controversy because researchers are polarised in their views about just how important school resources are. More recent research has gone beyond looking at resources in and of themselves, and moved towards understanding what organisational settings improve the efficiency of existing resource inputs (Duthilleul and Allen 2005; Lockheed and Hanushek 1988). Other features of schools that have proven to be important relate to teaching practices, school structure and the composition of the student population (Fuller 1987; Lee et al. 2005; Lockheed and Levin 1993; Wößmann and Fuchs 2005).

Because of the broader context within which schools operate and the different ways that studies are analysed, the strength of findings often differs across countries and across time. How research is carried out has tended to be contingent on the academic discipline of the researcher. In this chapter, I give an account of the development of school effectiveness research and how it applies to the education environment in the developing world. This is important because school effectiveness theories underpin the conceptual framework used in this thesis. I begin by discussing the characteristics of students, focusing on their social and academic background, because these factors shed light on how prepared they are for school. Thereafter follows a review of the literature addressing the main determinants of academic quality and equality in schools. Although I single out important international research, I pay particular attention to studies carried out in developing countries and to their policy implications.

2.2 Student Characteristics and Academic Achievement

2.2.1 Socioeconomic Status

The influence of a student's socioeconomic status on academic achievement is important for many reasons. It identifies the out-of-school environment that the student encounters and the resources available to support learning. Students with a stronger support system at home are more likely to perform well at school and are subsequently presented with better opportunities later in life. Variations in social support structures exist in all countries but because of widespread poverty in low-income countries, the influence of the home setting on academic achievement tends to be less varied there. In their seminal study of school effects on academic achievement in developing countries, Heyneman and

Loxley concluded that the poorer a country, the weaker the influence of student social status on academic achievement (Heyneman and Loxley 1983). This finding has been challenged recently, particularly in countries where mass education drives have increased the social diversity of the student population (Baker et al. 2005).

Irrespective of a country's economic circumstances however, an unsupportive environment at home will inevitably interfere with children's scholastic development. Among the factors traditionally used to capture socioeconomic status in education surveys are the levels of education of a student's parents, the occupation of the household head, the value of household income and the presence of educational resources within the home (Baker et al. 2002; Buchmann 2000; Nonoyama-Tarumi 2008). The first three are frequently referred to as status measures. Data have proven that household income and occupational status are less consistent predictors of student achievement (White 1982), whereas the parental education level has demonstrated greater reliability (Case and Deaton 1999; West et al. 1998; Willms and Somers 2001). It has become popular to use other estimates of household wealth such as the presence of certain household possessions or the structural features of the home (Filmer and Pritchett 1999; Heyneman 1979; Lee et al. 2005; Postlethwaite and Ross 1992). These items provide a more useful representation of a student's home situation. The obvious advantage is that household assets are visible and can be captured more accurately when collected as part of a student questionnaire. A further advantage is that in a study involving developing countries it cannot be assumed that various modern amenities will even be remotely available (Fuller et al. 1995). A suitable measure of socioeconomic status is vital if the effect of schooling on educational quality is to be understood because it is the *net* role of the school on student academic achievement that is of interest. Many studies have fallen into the trap of entangling the influence of the two effects (Riddell 1997). That three countries are involved in this study further heightens the importance of considering student socioeconomic status thoughtfully.

Seeking answers to questions about educational opportunity led to many seminal studies of educational quality. Two of the most influential examples are the 1966 Coleman Report in the United States and the 1971 Plowden Report of children in England and Wales (Coleman et al. 1966; Peaker 1971). Because the authors concluded that the influence of a student's home environment overshadowed the impact of the school, they sparked decades of debate about how educational reform should be shaped, which led to the growth of school effectiveness research. The issue remained unexplored in developing countries until Heyneman's research into Ugandan primary schools demonstrated that

school effects were the dominant influence on educational quality (Heyneman 1976a; Heyneman 1976b; Heyneman 1977; Heyneman 1979). The importance of school effects relative to home background will be detailed later in this chapter. The emphasis here is that socioeconomic status remains a factor of educational research, and although its influence may vary from country to country, it must be estimated with accuracy if school effects are to be understood. Failure to do so will call into question any research results into the role of the school in education, no matter how sophisticated the methodology employed.

2.2.2 Academic Support Outside of School

The literature on the academic advantages of children from rich households has concentrated on the material resources available to support their progress through school. Entwisle and associates have considered the issue in a slightly different way. They pointed out that the benefit of high economic status is related to the ability of students to continue learning even when away from school (Entwisle et al. 1997). Because poor students are less likely to have their homework supervised or to reside in neighbourhoods where mentoring is readily available, they are also less likely to build upon what they learn in school and more likely to arrive at school unprepared.

In some circumstances, academic support might be unrelated to socioeconomic circumstances. Less affluent students will still benefit if they are encouraged to practise what has been learned in school and if the value of education is reinforced regularly. In a study of family involvement in children's homework, Balli and colleagues (1998) demonstrated that test scores for children living with single mothers in less affluent homes improved when their mothers made time to supervise their homework. This type of family involvement reflects a positive cultural attitude about academic success. Chen and Stevenson (1989) would add that societies with a greater academic emphasis are also likely to look favourably upon homework tasks in general. According to Xu and Corno (2003), two of the most important ways that adults can provide academic support for children are through removing disturbances while children are working and through providing emotional support when children are struggling. They also report that these factors are valuable quite independently of parental educational level.

2.2.3 Grade Repetition

Most studies agree that there is a strong and significant association between student academic background and their performance in school, and that the strength of this association is greater in the early stages of schooling. Grade repetition is an important indicator of academic strength (Entwisle et al. 1997; Hanushek 1995). It occurs when students begin an academic year in the same grade as the previous year instead of advancing to the next grade level. According to Lockheed and Levin, compared to developed nations, the likelihood of repetition is almost five times higher in less developed parts of the world (Lockheed and Levin 1993). Grade repetition can also be influenced by national policy when regulations about automatic promotion are enforced so that unprepared students advance to the next grade level. Grade repetition is frequently associated with low socioeconomic status and with absenteeism (Brophy 2006). Typically students who repeat a grade do so in the early years of primary school. In developing countries this is especially common if students are unfamiliar with the language of instruction.

In some African countries, repetition rates in the later stages of primary schooling are related to national examination policies. Either parents or school principals encourage repetition if there is reason to believe that the student will be unsuccessful in primary leaving examinations. In countries where these results are made public, and a school's reputation is at stake, pressure on academically weak students to repeat the later grades of primary school tends to increase. Kenya represents one of the most striking examples of this practice (Abagi and Odipo 1997). A recent Ugandan study draws similar conclusions (Acana et al. 2003). Parents may support a decision for their children to repeat if they think it will improve their chances of attending a good secondary school. If students are forced to repeat a grade, this can lead to overcrowded classes and overstretched resources because students who are on grade level for their age will have to make room for students who are held back (Lockheed and Verspoor 1991). Therefore even students who have not repeated a grade are indirectly affected by a school's repetition practices.

There is some evidence of a positive relationship between student grade repetition rates and individual student test scores (Gomes-Neto and Hanushek 1994) indicating that repetition can be associated with higher achievement for the school as a whole (Lee et al. 2005). These short term gains are mostly the result of students revising familiar material. In the long-run, as these students advance to higher grades and are faced with more difficult

aspects of the school curriculum, the negative impact of repetition on performance begins to surface (Brophy 2006). Many studies have linked repetition practices to poor academic performance and to students dropping out of school (Haddad 1979; Jackson 1975; Westbury 1994). This has led critics of this policy to suggest that the costs of repetition far outweigh the benefits. It should also be apparent that as an estimate of academic background, repetition is an important dimension of educational quality not to be overlooked.

2.2.4 The Gender Effect

There has been a steady and universal move away from single-sex schools and towards co-educational learning environments. As co-educational schools increase in number, the question of how and why gender gaps in academic achievement exist has become an important issue. The issue has also gained prominence because it has been a focal point in expanding educational opportunities in developing countries (UNESCO 2005a) . Over the last four decades, researchers have shown considerable interest in the gender–based achievement gap. Beginning with the pioneering work of Maccoby and Jacklin (1974) and closely followed by the Fennema-Sherman studies in the 1970s (Fennema and Sherman 1977; Fennema and Sherman 1978; Maccoby and Jacklin 1974) a growing body of literature has explored the barriers and opportunities involved in the education of boys and girls (Alderman et al. 1996; Baker and Jones 1993; Felson and Trudeau 1991; Friedman 1989; Fuller et al. 1994; Jimenez and Lockheed 1989; Leder 1982; Lee and Bryk 1986; Lee and Lockheed 1998; Lee et al. 1994; Mensch and Lloyd 1998; Peterson and Fennema 1985). In general the gender gap in educational achievement is narrowing over time; the extent of change mirrors the broader status of men and women in a given society (Baker & Jones, 1993; Friedman, 1989). Differences in power and status between men and women in African countries have lagged behind more developed countries. Students spend the majority of their time living in a world where gender structures are strictly defined and these beliefs persist when they enter the school gates.

The majority of learners in this study are in their early teens, a time when young men and women are formally initiated into their differential social roles. In patriarchal systems such as those found in East Africa, a co-educational environment for girls who have reached puberty can be a source of anxiety for their families (Bendera 1998; Lee and Lockheed 1998). Some parents fear that educating their daughters will make them less

obedient and that this will jeopardise the bride price that the family will receive upon their daughter's marriage (Peasgood et al. 1997).

The link between gender and educational support in the home is associated with gender-based tasks that hamper school preparation. If girls have more domestic chores at the beginning and the end of each day (such as walking long distances to collect water or firewood, cooking, cleaning, and taking care of the younger siblings and elderly family members), then they will have less time to complete homework and may even be forced to miss days of school in order to focus on domestic tasks (Gordon et al. 1998; Peasgood et al. 1997)[9]. A related problem concerns the use of female students to perform chores while at school, such as cleaning classrooms and the houses of staff members (Colclough et al. 2003).

Depending on its direction, the involvement of parents can either help or hinder the gender effect. Often a girl is viewed as a temporary resident in her parental home. In this case parents are reluctant to invest in her education, as the returns will be enjoyed by her husband's family (Kanogo 2005; Kikampikaho and Kwesiga 2002). There is some evidence that the importance of parental involvement on gender and achievement depends on the age of the child and diminishes as a child begins to demonstrate independence in school and life choices (Muller 1998). In a Tanzanian study, negative parental attitudes about their daughters' inherent ability, strong cultural emphasis on the central role of marriage, and fears that educated women made poor marriage material all combined to create a poor self-image among female students, not only about their ability to achieve but also about the returns associated with educational achievement (Peasgood et al. 1997).

Expectations play a major role in how students measure their academic worth, even more so in a traditional context. If parents assume that boys are superior to girls in mathematics and if these ideas are echoed by teachers, girls lose confidence in their own abilities. Increasingly as they mature, they credit their success to external influences (perhaps a lenient teacher or an effective text book) and consider their failure a natural consequence of their academic limitations. For girls in this situation, there exist few opportunities for success because their accomplishments can never truly be linked to inherent aptitude. The social psychology literature on motivation has formalised the different gender-related attitudes toward mathematics that are transferred from parent and teacher to a student. According to Carol Dweck (1986), girls operate within an entity theory to mathematics. They believe that the ability to do mathematics is inherent and unchangeable and they are conditioned to think that they lack this innate aptitude. Boys, on

the other hand, believe that skills in mathematics can be learned and improved through hard work. Treatment by teachers will reinforce these perceptions. If we follow this reasoning, student self-perceptions suggest that when boys under-perform it is because they are lazy or bored with their work, but when girls do the same it is because of limited ability. Therefore boys are encouraged to work harder whereas girls are advised to give up and face reality.

In the long run, biased socialisation patterns also influence the courses that boys and girls select when options are available (Parsons et al. 1982). According to this theory, because girls believe that they lack mathematical ability, they become performance-oriented and are driven by a desire to avoid criticism at all costs. Even when they do well consistently, female high achievers refuse to attribute their success to their intelligence or to develop confidence in their ability. Interestingly, Dweck (1986) observed that this tendency towards suppressed personal affirmation is especially common in exceptionally bright girls. In an effort to formalise the effect of expectations on the gender perceptions about mathematics and science, researchers have developed and tested several attitude scales (Adams 1984; Fennema and Sherman 1977; Keeves and Kotte 1992). Although the emphases of these studies differ, the consistent message is that attitudes of girls and boys about mathematics and science differ, that society and local culture influences these views, and that schools can play a role in changing or rectifying these attitudes.

In their role in children's social development, school administrators and teachers face a special responsibility to promote gender equity, often in opposition to prevailing beliefs and at the same time to serve the needs of the local community who entrusts its children into their care. Within the classroom, there is evidence that more attention is given to male students and more difficult questions are directed at them (Jimenez and Lockheed 1989; Mensch and Lloyd 1998). This pattern may be due less to conscious sexism than with discipline issues where more energy is required to keep male students in check. Linn and Hyde (Linn and Hyde 1989) have argued that the direction may actually be reversed. Boys' tendency to be more vocal about their academic concerns may evince more attention from teachers. Any aggression or restlessness may in fact be taken to mask intelligence, leading teachers to devote more time to such boys. Greater confidence among male students may also motivate them to approach learning of mathematics in more innovative ways. Should girls lack confidence because they find themselves in unsupportive environments, they may cling to prescribed methods of learning, regardless of their effectiveness (Lee et al. 1994).

Peterson and Fennema (1985) explored the link between differential treatment in the classroom and how girls and boys approach their academic tasks. They concluded that the effect of classroom practices was far more nuanced than previously suspected. Not only the attitude of teachers, but also the organisation of learning tended to favour boys. One striking example given was that widely used competitive approaches to learning favoured boys whereas girls thrived within a more co-operative framework (Peterson and Fennema 1985).

There is conflicting evidence with regard to whether a teacher of the same sex provides a level of mentorship and improves learning prospects for female students, especially in developing countries. Female teachers can operate as role models and help motivate girls to perform better (Fuller and Clarke 1994; Lee and Lockheed 1998). In some instances, however, female teachers may reinforce gender stereotypes. In their research, Mensch and Lloyd (1998) found that female teachers in Kenya actually preferred teaching boys and considered that maths was more important for boys than for girls. In Tanzania, Peasgood and colleagues (1997) reported that teachers had lower expectations about the potential of their female than male students and actually assigned domestic tasks to girls while they were at school. Of course the presence of female teachers may be confounded by school location, with obvious logistical barriers related to accommodation and security for women teaching in rural areas. Thus, competent female teachers may prefer to teach in urban schools unless they have family connections in a rural community (Peasgood et al. 1997; Warwick and Jatoi 1994).

The peer effects related to gender composition of classrooms appear to work in opposite directions for girls and boys. Co-educational learning environments may be a more natural platform for perpetuating the prevailing gender roles in society. The female gender disadvantage in coeducational settings is especially marked in science and mathematics, because girls may be conditioned to believe that they cannot cope. Yet girls seem to achieve better results in all subjects (including maths and science) and have higher academic aspirations in a classroom environment that is predominantly female whereas boys appear to excel in a coeducational setting (Jimenez and Lockheed 1989; Lee and Lockheed 1998; Lee et al. 1994). Lee and Bryk (1986) suggested that single sex secondary educational environments in Catholic schools provided an opportunity for girls to explore their interests and to fulfil their potential without the added strain of society's expectations. A few of these studies have actually been based on African data but the issue has not been adequately addressed on a cross-national basis in a development setting with a sample of

co-educational primary schools. Interestingly, Felson and Trudeau (1991) found that in some aspects of mathematical achievement, girls were able to outperform boys and that the investigation into why girls lag behind should focus on more specific areas of a curriculum.

To what extent can the gender gap in performance be attributed to differences in the approach to this discipline? In their ground-breaking work into gender differences in achievement Maccoby and Jacklin (1974) asserted that differences between the sexes were present in many areas including quantitative subjects, verbal ability and spatial ability. Spatial ability in particular has captured the imagination of mathematics educators. It deals with the way in which geometric figures can be mentally manoeuvred in order to solve problems. It is speculated that the demonstrated disadvantage in spatial ability among female students largely explains their mathematical limitations. The work by Fennema and Sherman and later Fennema and Tartre effectively showed that this was only true for girls who were on the very low end of mathematics ability (Fennema and Sherman 1977; Fennema and Sherman 1978; Fennema and Tartre 1985). In other words, spatial ability problems do not affect all girls uniformly. Gray (1996) would add that there is evidence from European countries where mathematics is part of a compulsory curriculum and where female participation is the norm rather than the exception. Women's attainment of science based doctoral degrees in these countries is far beyond other developed countries.

According to Linn and Hyde (1989) there are differences in how girls and boys perceive the utility of mathematics. It is quite possible that the greater utility that boys associate with technical subjects is related to the number of men that they see applying these subjects to their professions (Fennema and Sherman 1977; Fennema and Sherman 1978). As more women reach high-status positions, what girls see as within the realm of possibility is likely to change. Yet to form part of this critical mass, girls first need to succeed in these subjects in school. It is hardly surprising then that one of the recommendations of the Fennema-Sherman studies was to encourage girls to enrol in advanced level mathematics courses. An endorsement for this hypothesis in the developing country context is found in Duncan's study of science achievement in Botswana (Duncan 1989). This work showed that girls and boys were affected differently by their learning environment and that gender stereotypes regarding female professionals coloured female students' attitudes. In summary, there is a complex combination of factors that contribute to the gender gap in mathematics and the weight of different factors has much to do with the local context.

2.3 School Effectiveness and Academic Achievement

So far, I have focused on how student background characteristics can influence student academic performance. Research has consistently shown that even after equalising for student background, students perform better in schools with certain characteristics. School effectiveness research is the systematic study of what types of schools encourage student achievement. Student achievement is most generally estimated by performance on standardised achievement tests. This type of research became popular in the 1960s because the Coleman and Plowden reports found that the influence of a student's home environment dwarfed the role that the school could play in student success. Many researchers rejected the notion that schools did not matter and this dissent sparked off decades of debate about how educational reform should be shaped and led to the birth of the school effects movement.

Because of the Coleman findings, the importance of school effects relative to home background has been debated widely and passionately (Fuller 1998; Hanushek 1996; Hedges et al. 1994; Heyneman and Loxley 1983; Hoxby 2000; Krueger 1999). What sets school effectiveness research apart from other educational research approaches is its premise that schools differ in student achievement, and that characteristics of schools can be identified to explain the differences in subject mastery. An underlying assumption is that it is the responsibility of the school to ensure that high standards of achievement are reached (Purkey and Smith 1985). Studies of school effectiveness among industrialised countries have mainly targeted secondary schools whereas primary schools have dominated developing country research. Decisions about which school factors to focus on have depended on the varying perspectives of the researchers, with economists focusing on resources and sociologists concentrating on the organisation of the school (Scheerens 2000). Economists often add the efficiency dimension to their research agenda because they are interested in maximising academic output while minimising input costs (Lockheed and Hanushek 1988).

School effectiveness research has advanced in terms of data quality and methodological sophistication. The availability of individual student, classroom and school data has made this possible. So too has the use of multilevel analytical methods, because this technique retains the integrity of the different levels of information. Early studies of school effectiveness used aggregated data so that the entire analysis was conducted at the level of the school and the power of the analysis severely compromised (Heyneman and Jamison 1980). Other influential studies used individual students as the unit of analysis,

thus overstating the importance of school effects (Heyneman and Loxley 1983). This body of research has become more quantitative and often makes use of longitudinal data so that learning across time, rather than achievement at one point in time is studied (Lockheed et al. 1986; Wright et al. 1997). This last point distinguishes school effects research (that makes use of longitudinal data and therefore can make causal inferences) from other strands of school effectiveness research (that use cross-sectional data). Ultimately, the aim of school effectiveness research is to optimise the school environment so that academic achievement can be maximised. Where education systems are relatively homogenous, the study of school effects is less imperative.

Early school effectiveness enquiries concentrated on why schools that served urban poor populations managed to perform far better than expected (Edmonds 1979). What seemed to make these schools remarkable was their outstanding leadership and organisational characteristics (Reynolds et al. 2000; Scheerens 2000). There are few studies from developing countries that integrate these elements when looking at school effectiveness (Fuller 1987). In fact, the vast majority of studies of school effectiveness in developing settings are of the education production function type, with an emphasis on which school resources can maximise educational achievement.

The main emphasis of school effectiveness research rests on improving overall scholastic achievement. However there is another important dimension of effectiveness that considers how achievement is distributed between different groups of students. In other words, it considers whether the presence of educational inputs reduces disparities in achievement between different groups of students within the same school. The focus on differential effectiveness, or narrowing achievement gaps, is an important part of this thesis. In this thesis I consider gender and wealth disparities in achievement. Specifically I look at social background differences in literacy achievement and gender gaps in mathematics achievement. Because literacy is partially learned outside of the school, it is more dependent on external factors, such as student socioeconomic status than other academic outcomes. The challenge that a school faces in improving the social distribution of reading achievement must be studied very closely because more than in any other area, less affluent students perform systematically worse when compared to their wealthier peers (Heyneman 2005; van Steensel 2006). Mathematics is a subject where girls traditionally lag behind boys. In co-educational schools, differences may exist between how boys and girls perform in certain school subjects. Interest here is in whether an interaction between

school-level and student-level characteristics is meaningful because this will show which types of schools are best equipped to deal with inequality.

There is a distinct difference between the strength of school effects in developed and in developing countries. Typically, school effects produce more robust results in developing countries. Part of the reason for this difference is that schools in developed countries have a broadly similar supply of material inputs. Another reason is that educational outcomes tend to be highly variable in developing countries. Even in developing countries, however, some school effects appear to be more consistent predictors of achievement than others. The importance of basic physical infrastructure, teaching resources and teacher competency is well established across developing countries. Other characteristics of schools, such as class size, present mixed evidence, depending on the manner in which the study was conducted. Elements of school organisation that often play an indirect role in improving academic achievement have not been studied systematically enough in developing countries to draw firm conclusions about their effect (Fuller 1987; Lockheed and Hanushek 1988). Small studies suggest the need to integrate these organisational characteristics into an understanding of effective African schools (Cohn and Rossimiller 1987). The body of literature on school effectiveness is vast but my purpose here is to review in detail those components of schools that relate to my investigation. I separate each section of the review into evidence from developed and developing countries and highlight literature that focuses exclusively on Africa.

2.4 The School Effects Debate

2.4.1 Class Size - Evidence from Industrialised Countries

Perhaps one of the most contentious issues in the field of education relates to how class size influences what students learn. Those in favour of smaller classes argue that student achievement will improve if teachers are in a better position to attend to individual student needs. Smaller classes are also believed to increase teacher and student morale (Finn and Achilles 1990; Galton 1998; Korostoff 1998). The terms 'class size' and 'pupil-teacher ratio' are frequently interchanged but they are calculated quite differently. Class size refers to the number of students under the instruction of a given teacher, whereas the pupil-teacher ratio refers to the proportion between the total number of students in a school and the total number of educators (including administrative staff). Pupil-teacher ratios are therefore smaller than class size estimates because of the inclusion of non-

academic staff, and differences between the two can lead to measurement error and biased estimates. Where teacher absenteeism is pervasive, actual class size may be even larger because classes (and even grades) may be combined. Compared to the pupil-teacher ratio, the actual class size is a more precise measure because it represents the instructional environment more accurately (Odden 1990). Nonetheless, many authors maintain that for practical analytical purposes, the differences between the two are marginal and where detailed data on class size are unavailable, the pupil-teacher ratio can be used as an approximation of class size (Lee and Barro 1997).

That smaller classes are related to improved academic outcomes was first publicised by the extensive meta-analysis of eighty studies on class size carried out by Glass and Smith (Glass and Smith 1978). Other research has lent support to these findings, more so when large reductions in class size occur (Angrist and Lavy 1999; Bosker 1998; Molnar et al. 1999; Slavin 1989; Word et al. 1990). In some cases, the results have been qualified because the effects of reductions in class size have been combined with the effects of changes to curriculum and teaching methods (Murnane and Levy 1996). Class size is recognised as particularly important at the primary school level when the foundations of literacy and numeracy are laid and many of the most prominent studies have focused on the early primary school stage. For example, the Tennessee Student/Teacher Achievement Ratio study (Project STAR) was a randomised experiment designed specifically to investigate the importance of class size at the onset of schooling. Between 1985 and 1989 both teachers and students in the study were randomly assigned to classes of different size. The study involved over 6,000 pre-primary and primary school students from different socioeconomic backgrounds. The results were conclusive. Pupils in smaller classes performed better on standardised tests (Word et al. 1990). Because new teachers were randomly assigned to a class at the beginning of each academic year, the study countered the popular argument about teacher quality driving small class gains.

Results from other longitudinal studies in the United States have also indicated that the benefits of small classes are cumulative, and in order to obtain the greatest gains from smaller classes, students must be taught in this environment as early as possible (Nye et al. 2001a; Nye et al. 2001b; Word et al. 1990). Placing students in small classes for one academic year is unlikely to yield significant achievement gains. Another question is whether class size benefits all students equally. According to Nye and colleagues, there is some evidence to suggest that gains from small classes are greater for minority students in reading, and for boys in mathematics, and that the positive effect may last for as long as

five years (Nye et al. 2004). Other studies have also found improvements in the minority gap that are associated with class size, though the strength of these findings are often weak compared to the evidence about class size on academic achievement in general (Molnar et al. 1999; Nye et al. 2000; Word et al. 1990).

The question of an optimal class size has also been explored. The Glass and Smith paper concluded that the greatest benefits were found when class size was reduced to less than twenty students per class (Glass and Smith 1978) and the Project STAR research also recommended class size within that range. And yet class size is one of the most expensive school reforms to administer because new classrooms must be built and qualified teachers hired. If schools are situated in remote areas, teachers may require accommodation. There is certainly a need to balance the costs involved against the benefits accrued to staff and students (Hanushek and Wößmann 2007). According to Levin, compared to other strategies such as peer-tutoring, the financial costs of reducing class size far outweigh the benefits, especially when reading achievement is considered (Levin 1988).

Since the publication of the Glass and Smith findings, an increasing body of literature has accumulated to counter their results. Class size and pupil-teacher ratios have been widely used in education production function studies that consider the impact of measurable educational inputs on maximising educational outcomes. Research conducted by Hanushek consisted of reviews and analyses of education surveys to determine whether there was any conclusive evidence about the relevance of class size to schooling (Hanushek 1986; Hanushek 1996; Hanushek 1999; Hanushek et al. 1996). This work and other American studies (Darling-Hammond 1999; Hoxby 2000) have cast some doubt on the strength of the link between smaller classes and academic achievement. However, they in turn have been vigorously countered on conceptual and methodological grounds (Hedges and Greenwald 1996; Hedges et al. 1994; Krueger 2003).

Other international evidence is equally mixed. For example, results from Asian countries generally reflect the absence of class size effects on the quality student outcomes (Gundlach and Wößmann 2001; Wößmann 2005). This is possibly because from an early age children in Asian traditions are socialised in such a way that classroom disruptions are minimal, and whole-group teaching of large classes is possible (Biggs 1998; Jin and Cortazzi 1998). In contrast, Angrist and Lavy (1999) found conclusive evidence that smaller classes improved reading and mathematics scores among Grade 5 students in Israel.

A more salient issue related to class size that has emerged in international literature concerns the policy of assigning weaker students to smaller classes, which then spuriously

reflects a positive association between class size and educational outcomes. After controlling for this practice, Akerhielm (1995) isolated a positive association between class size reduction and achievement in American public schools. Cross-national comparisons have also suggested that there might be diminishing returns associated with reducing class size (Wößmann 2000). The indirect effect of a streaming policy to place weaker students in smaller classes was the explanation given for a similar finding in a recent Australian study (Darmawan and Keeves 2006). To test for the possibility of streaming practices, Hanushek and Luque (2002) conducted a separate analysis with data from rural schools and information on whether sampled classes were smaller than average. Because rural schools were less likely to have more than one class, they argued that such schools would present a clearer picture of the association between class size and scholastic achievement net of a streaming effect. However even with these adjustments, they found no concrete evidence of achievement gains related to smaller classes.

2.4.2 Class Size - Evidence from Developing Countries

Compared to developed countries, classes in developing countries tend to be far more crowded. Whereas middle-income and high-income countries experienced steady reductions in pupil-teacher ratios over the last thirty years, there was very little change in low-income countries (Fuller 1986; Lee and Barro 1997). Between 1965 and 1985 average class size estimates for low-income countries were in the range of 39 to 42. Average class sizes in high income countries fell from 28 to 20 across the same period (Lockheed and Verspoor 1991). Although existing literature on class size in developing countries is limited it would seem that the marginal effect of class size reduction should be much greater, given that conditions are so poor to begin with. Nonetheless, evidence on the impact of class size remains ambiguous even in these settings.

In their early review of developing country studies, Simmons and Alexander (1978) found mixed results on the effect of class size. Nor was there a geographic pattern among the study results. A mixture of countries from Latin America, Asia and Africa presented results on both sides. Fuller (1987) also found a lack of consistency in reviewing results from developing countries. Of the sixty studies he included in his review, all made adjustments for pupil socioeconomic status and yet only in one Argentinean survey were smaller classes associated with significant increases in academic achievement. Further evidence that reducing class size made little difference to educational quality in Latin America was provided by Fuller's later study conducted in Northeast Brazil (Fuller et al.

1999) and in work done by Wößmann and Fuchs in Argentina and Columbia (Wößmann and Fuchs 2005). An extensive review of educational quality in Latin America and the Caribbean further corroborates these findings on class size (Velez et al. 1993).

Using an education production function approach, Lee and Barro (1997) constructed a panel data set using data from a variety of countries in different settings during a period spanning the 1960s to the 1990s. They determined that smaller class size benefited a number of educational outcomes including test scores, repetition rates and dropouts. In their analysis of thirteen Latin American countries, Willms and Sommers (2001) found modest improvements in scholastic achievement associated with reduced class size, but noted that very small classes were linked to lower achievement. Among the investigations that focus exclusively on African countries, Michaelowa (2001) drew very similar conclusions to Willms and Sommers in her analysis of data from five Francophone African countries. In contrast, Case and Deaton's (1999) South African study found that schools with high pupil-teacher ratios performed poorly. However, the authors conceded that the strength of their findings might have been reduced had teacher quality been included.

The results of this summary present a bewildering array of evidence. However, several general conclusions can be made. First, researchers investigating class size have adopted various methodologies, including meta-analyses of earlier studies (Glass and Smith 1978), reviews of existing literature (Hanushek and Wößmann 2007; Odden 1990), education production functions (Akerkielm 1995; Lee and Barro 1997; Wößmann 2005), hierarchical linear modelling (Bosker 1998; Michaelowa 2001; Nye et al. 2000; Nye et al. 2004; Willms and Somers 2001), quasi-experimental designs (Molnar et al. 1999; Murnane and Levy 1996) and sophisticated randomised studies (Finn and Achilles 1990; Word et al. 1990). Second, it is clear that the evidence on class size effects is very mixed both within countries and across regions, and that differences are independent of a country's economic development. Third, where the most conclusive evidence about class size reduction exists, it has emerged at the primary school stage. Fourth, class size reduction does not necessarily impact all students uniformly and students who are at greater risk of academic failure may benefit more from class size reduction. Fifth, studies of class size effects may suffer from endogeneity biases should there be a practice of placing weaker or stronger students in smaller classes. Sixth, there is in an indirect cultural dimension involved in class size so that it may be an issue in some contexts but not others. Finally, the academic gains that accrue from smaller classes are related to other effects of schooling, especially the resources available for teaching and the quality of instruction. In other words, class size

reduction as a policy, though important, cannot be isolated from the consideration of other school effects, particularly those factors that relate directly to the classroom environment. This will be important to bear in mind in later empirical work.

2.4.3 School Physical and Human Resources - Evidence from Industrialised Countries

Research on the importance of physical resources in industrialised countries seems to indicate that basic facilities have limited explanatory power in terms of differences in student achievement. This is hardly surprising because certain basic resources are readily available even in what are considered poor communities, where lessons might be regularly conducted outdoors in many less developed parts of the world. Teacher quality, on the other hand, has become a highly charged issue in developed countries, in part because of legislation that guarantees all students be taught by "highly qualified" teachers (U.S. Department of Education 2004).

Research has produced mixed results on the importance of teacher quality, ranging from assertions of no direct association to student test scores (Hanushek 1986) to studies that claim strong and lasting benefits for student development (Darling-Hammond 1999; Murnane and Phillips 1981; Rice 2003; Wright et al. 1997). The analysis of longitudinal data from Tennessee that was conducted by Wright and associates (1997) emphasised the importance of having a consistent stream of quality teaching. Students who had one year of ineffective teaching followed by another year of good instruction struggled to make up for what they had missed. Rockoff's meta-analysis of schools in the American state of New Jersey found evidence that teacher experience had a positive effect on reading performance (Rockoff 2004). Murnane and Phillips (1981) found that experienced teachers were especially effective in teaching students from inner city schools. Their conclusion was that more experienced teachers were better able to meet the needs of students from poor communities. Unfortunately, the distribution of quality teachers tends to be imbalanced and it is wealthier students that are more likely to be taught by highly competent teachers (Hill 2007). Research has also demonstrated the importance of teacher qualifications matching the subject matter taught (Darling-Hammond 1999), especially for mathematics and science subjects (Hill 2007; Rice 2003). Darling-Hammond (1999) made the important observation that teacher certification in a particular subject could prepare teachers more effectively than a Masters degree in education, if the latter focused on subject matter that was far removed from teaching.

2.4.4 School Physical and Human Resources - Evidence from Developing Countries

Whereas both high and low-income countries present mixed evidence on the importance of class size to academic achievement, school resources seem to be more consistently linked to better performance in developing countries (Heyneman and Loxley 1983). The dramatic difference in how school facilities are distributed sets developing and developed countries apart (Heyneman and Loxley 1983; Lockheed and Hanushek 1988). Many studies of resources in developing countries are of an education production function type and focus on monetary inputs that are visible in schools and easily quantified under survey conditions. The presence of resources can have an especially marked benefit on children from low-income homes who have access to fewer supplementary learning materials (Heyneman et al. 1981; Wolff 1970).

The importance of teaching and learning materials has received widespread attention for its association with higher academic achievement. For example, there is mounting evidence that textbook availability has a significant overall relationship with academic achievement across a wide representation of developing countries (Fuller 1987; Fuller and Clarke 1994; Heyneman and Jamison 1980; Jamison et al. 1981; Lockheed et al. 1986; Velez et al. 1993).

Related to textbook availability is the presence of a school library which has proven to benefit academic achievement (Heyneman and Loxley 1983). In their study of Ugandan primary schools, Heyneman et al. established an important link between access to textbooks in the early grades and performance at the end of primary school. These findings suggested that the benefits of exposure to textbooks could be far reaching (Heyneman et al. 1981). Furthermore, schools with quality teaching facilities are also likely to attract better teachers (Lockheed and Verspoor 1991).

Evidence from Uganda in the 1970s highlighted the strong association between material inputs and academic achievement. Resources were a stronger predictor of achievement than student social background (Heyneman 1976b; Heyneman et al. 1981; Heyneman and Jamison 1980). These findings were especially important at the time because they directly challenged emerging research from industrialised countries that schools played a minor role in educational quality. From a local perspective, the results were important because in the 1970s, Uganda's centrally managed education system was meant to guarantee equal distribution of school resources and to standardise the quality of

material inputs (Heyneman 1975). There were differences in resource levels that resisted government policy to equalise the education system.

These differences underscored the ongoing tension between government authorities and other agents who were linked to the school to determine how schools operate. Why was it that certain schools were more successful than others in securing adequate resources? Resource distribution seemed to favour urban locations and schools with more affluent students. It was also influenced by the involvement of school administrators and communities in the education process (Heyneman 1977). It is slightly puzzling that Heyneman found that student social socioeconomic status influenced resource distribution but had a negligible influence on student academic achievement. There are many possible reasons for this surprising result. Heyneman attributed these findings to the absence of social stratification in Uganda at the time. I take a different view. The measure of socioeconomic status was based on a series of 'modern' amenities that might not have been a contextually relevant predictor of wealth in all parts of Uganda at that time. More seriously, the study failed to distinguish between the individual influence of socioeconomic status on achievement and the collective effect that student social class had on achievement and its equitable distribution at the school level. I further detail the literature on Uganda in Chapter 5, when models of literacy achievement and the social inequality are presented.

The fact that local management made a difference to the organisation of learning, even in early studies on African education, is interesting and important. To some degree, this is a universal finding, irrespective of a country's level of economic development. Because of the presence of abject poverty in many African communities, resources will invariably have a greater marginal impact than in wealthier settings. Obviously having a desk to write on and a school building to shelter students from bad weather will encourage the learning process. But regardless of where a school is situated in the world the benefits of material inputs will be maximised by a well managed schooling environment. And the ability of school administrators to manage their schools effectively, to ensure that adequate resources are available, relates directly to the power that they are given by national education departments (Lockheed and Verspoor 1991). In situations where national departments are grossly inefficient and local schools have no recourse to compensate for these deficiencies, poorer schools will suffer the most, because schools with access to alternative means will continue to function effectively.

The most conclusive evidence of resource effectiveness can be gathered from a randomised study. Such a study in Nicaragua found that teaching resources were even

more important than class size in raising achievement (Jamison et al. 1981). This result contrasts with a randomised study of twenty-five rural primary schools in Kenya, in which the provision of text books raised the test scores of the top performing students but had a limited effect on average performance (Glewwe et al. 1998).

Research into whether and to what extent the quality of teachers matters in African schools has started to receive considerable attention. Many governments are overwhelmed by severe teacher shortages for public schools. It is estimated that over three million teachers are required in order to provide universal access to primary education in poor countries (Lockheed and Verspoor 1991). Pressure to lower entry requirements for teacher training programmes is high. Understanding which kinds of teachers make the greatest difference to student success increases the possibility of preparing new teachers more adequately. Estimates of teacher quality in developing countries have tended to be quite crude. Information on teacher experience and education levels is fairly common but what these variables actually translate to can vary significantly depending on local conditions. Better student performance seems to be strongly associated with teachers who have higher professional and academic qualifications (Fuller 1987; Heyneman and Loxley 1983). In their review of Latin American studies, Velez and colleagues noted that although teacher qualifications seemed to matter, levels of in-service training had no systematic influence on student achievement (Velez et al. 1993).

Park and Hannum's analysis of Chinese education data found that teacher characteristics explained a large proportion of the heterogeneity in student achievement, a result that held in different subject areas (Park and Hannum 2001). The few studies that directly assess teacher competency have found a very strong relationship between teacher subject matter knowledge and student achievement (Fuller et al. 1999; Heyneman and Jamison 1980; Lee et al. 2005; Mullens et al. 1996). Lee et al. (2005) used a unique construct of teacher quality that combined information on teacher professional and academic experience and subject matter knowledge. They found a strong relationship between teacher quality and reading literacy in four out of fourteen African countries, over and above the influence of school and teaching resources.

It is slightly surprising that with such a robust measure of teacher quality, it had significant impact in only four countries. There are a number of possible reasons for this result. First, variability in teacher quality differed from country to country. Second, the fact that data were cross-sectional and not longitudinal would have suppressed the measurable effect of teacher quality, especially given that studies in other countries have shown that an

effective teacher may be unable to reverse the damage of an ineffective one in a short period of time. Finally, it is possible that the relationship between teacher quality and student test scores was non-linear and made more of a difference for some students than for others depending on their ability level. These reasons raise the question of whether teacher quality can operate through an incentive structure. If it can, teachers who have lighter loads and are better paid will be more motivated to teach (Chisholm et al. 2005; Vegas and Umansky 2005). Results on teacher salaries and academic achievement are inconclusive (Fuller 1987; Park and Hannum 2001). Lockheed and Verspoor have pointed out that the low status of primary school teaching in developing countries has meant that salaries and working conditions are often poor and that the opportunities for career advancement are few. It has proven difficult to attract the best students to the profession. No doubt the challenge of raising the status of teaching in primary schools will involve "…policies that strengthen the knowledge base of prospective teachers, enhance their teaching skills, and improve the conditions under which they work" (Lockheed and Verspoor 1991, p.92).

The review of literature on school resources shows that school material inputs are more important in developing countries than in developed countries and that teacher quality can make a difference, especially when subject matter knowledge is high. Obviously the quality of resources cannot be addressed without considering the organisation of learning. If teachers are technically competent but still lack the skills to organise the teaching process, "not enough time is left for them to turn their verbal intelligence into sound instruction" (Barr and Dreeben 1983, p.2). The level and quality of resources present only part of the picture and must be considered in the light of how schooling is actually organised.

2.4.5 School Organisation - Evidence from Industrialised Countries

Theories of school organisation are not new, but data to analyse the impact of organisational effects on academic achievement have only become available in the last two decades. In industrialised nations, studies of school organisation tend to focus on secondary schools (Lee et al. 1993). Organisational issues surrounding primary schools are quite different because students usually use one classroom for all their lessons, often with the same teacher presenting different subject material (Entwisle et al. 1997). Interest in school organisation flourished in the United States in an effort to understand why it was

that students in non-government schools (private and religious schools) outperformed their peers in government schools, and why student social class and ethnicity mattered less in explaining achievement differences in those schools (Dreeben 2006). Pursuing these questions led to studies of how non-governmental schools were organised and what, if anything could be learned from their organisational style.

Coleman and his colleagues conducted the first major body of research in this regard based on the 1980 High School and Beyond dataset (1982). For example, they found that the common identity shared by members of religious schools made it easier to create an ordered climate for learning. School leaders could rely on support from parents, who purposefully selected these schools because of affiliation to the school's belief system. Parents were more likely to endorse the school's approach to teaching and socialising children. Other research has corroborated these findings (Bryk et al. 1993; Coleman and Hoffer 1987). This organisational approach has been described as more communal and inclusive. Students and teachers are encouraged to engage with one another and teachers collaborate on tasks (Lee et al. 1993).

Even though the organisational advantages of non-government schools are now widely accepted, researchers still disagree about how to transfer these lessons to benefit government schools. According to Chubb and Moe (1990), increasing school autonomy and empowering parents with a choice about school selection may compel school administrators to organise learning more effectively because of pressure to attract good students. Critics have pointed to methodological flaws in the Chubb and Moe studies, especially in the construction of an organisation index for schools (Bryk and Lee 1992; Glass and Matthews 1991; Lee et al. 1993). And although there is some evidence based on small scale studies that creating greater choice in school selection can lead to improved learning outcomes (Raywid 1985), serious questions remain about how to implement such a system on a wide scale. The realistic challenge remains how to organise government schools better.

In this study, and due to the nature of the data, I focus on one area of school organisation: non-academic organisation. Although data constraints and standardised primary school curricula prevent an exploration into school academic organisation, I mention it briefly here to show how it relates to other organisational effects. It is often characterised by the variety of the school curriculum, the organisation of departments and classes and the relative importance of academic activities in school life. Schools are considered to have high academic organisation if they have narrower curricula and a

tendency towards more academically intensive subjects. Other authors have described this organisational property as the academic emphasis of the school (Hoy et al. 2006). Such schools are more equitable, possibly because there is a more even delivery of rigorous courses and similar expectations of all students.

Non-academic organisation captures the collective attitude of teachers within a school for the academic welfare of their students. Schools with teachers who take personal responsibility for the progress of their students and are committed to improving each student's performance are considered more effective and more equitable (Lee 2001). The climate of discipline and the ability to limit absenteeism are also elements of non-academic organisation. Although decisions about the length of the school day are often determined by external policy, other issues related to attendance and the disciplinary climate vary considerably across schools (Dreeben and Barr 1987). Fluctuation in attendance and time wasted on unrelated tasks (such as resolving student disputes) will have a negative impact on the quality of learning. Previous studies have demonstrated that after adjusting for student socioeconomic status, there is a strong relationship between student attendance and student test scores (Fogelman 1978). There is also evidence that regular attendance and uninterrupted instructional time improve student performance (Anderson et al. 1989). Research suggests that the importance of instructional time and achievement is particularly strong in high performing schools (Fredrick 1980). A study of OECD countries also established a strong negative correlation between academic achievement and frequent student disruptions (Jürges and Schneider 2004). Some teachers are known to have predetermined notions about the type of students who need to be disciplined. Hallinan cautions against rushing to identify academically weak students as being badly behaved. Obviously this affects student morale and may become self-fulfilling (Hallinan 1987).

2.4.6 School Organisation - Evidence from Developing Countries

In the past, bureaucratic management styles have been widely used in the developing world, especially in government schools that are exclusively financed by state resources. School principals usually report to a district administrator who, in turn, reports to the national education department. Sometimes individual schools or clusters of schools are also guided by governing boards consisting of parents and community representatives (Lockheed and Verspoor 1991). Bureaucratic management models are more formal and endorse strict adherence to authority structures. The decision-making ability of the school head is often limited or unclear and the efficiency of district administrators varies.

Lockheed and Verspoor (1991) have reported that structural inefficiencies have severely hampered the performance of district officers in Tanzania. At the school level they have described how school principals are restrained in the actions they can take against ineffective members of staff.

For decades, it has been argued that a bureaucratic organisational style to school management is more egalitarian for poor countries because rules and regulations can be generalised, and in theory students are exposed to the same learning environments regardless of the school they attend (Bidwell 1965; Boyd 1983; Lockheed and Verspoor 1991). Fuller makes the important point that a hierarchical approach to school management might have more to do with the cultural context of the school than with a deliberate choice made by school management. "A hierarchical style of school management would be viewed as desirable in some national contexts; a more participatory and professional school structure would be normative in other cultural settings" (1987, p.285). However, Lockheed and Verspoor (1991) argue that highly bureaucratic systems can only really be successful in countries that have sound administrative systems, a well developed infrastructure to ease travel and a fairly equitable system of schooling. They cite Korea as an example of where this approach has been successful. Recently, international institutions like the World Bank, have encouraged developing countries to move away from centralised systems and to increase school-based management (Boissiere 2004). For instance, in Uganda, after UPE was introduced, efforts were made to transfer authority to district officers (World Bank 2002).

A successful organisational approach in a developing context will have to take different attributes of bureaucratic and participatory styles into account and adapt them to local conditions. The literature on third world countries has concentrated on the characteristics of the school principal, because it is assumed that creating an effective organisational climate will depend on good administrative leadership. Results have been mixed. Some researchers have shown that students in schools where principals are more qualified and more actively involved in the running of the school have better achievement scores (Eisemon and Schwille 1991; Lockheed and Verspoor 1991) . Other studies have shown no association with achievement or its distribution (Fuller 1987).

Research on elements of non-academic organisation is clearer. Activities that increase the opportunity to learn are associated with better academic performance. One Brazilian study found that reading achievement improved when teachers spent less time reprimanding students and when students engaged more frequently in instructional tasks

(Fuller et al. 1999). Lockheed, Fonacier and Bianchi (1989a) discovered that frequent testing and quizzes improved test scores in the Philippines. More importantly, decisions about student testing had less to do with teacher experience and were instead attributed to school management decisions. A study of Botswanan schools concluded that regular attendance was associated with higher reading achievement. (Fuller et al. 1994).

Non-academic organisation can also define a school's relation within the community, a feature that is especially important in developing countries where community ties are strong. Active community involvement can improve student well-being. Members of staff are held accountable to parents if parents take a regular interest in school activities. There is evidence that schools that rely on local sources for financial support are more efficient because communities can assess the needs of the school more quickly and effectively (Jimenez and Paqueo 1996). Local contributions are usually more cost effective when compared to centrally administered schemes (Scheerens 2000).

Teacher attendance is another important dimension of non-academic organisation in developing countries. Lockheed and Verspoor (1991) reported that attendance problems among teachers led to poor student performance among students in various developing countries, and that teacher absenteeism often led to increased rates of student absenteeism. There is a strong link between teacher motivation and teacher effort (Glewwe et al. 2003). Efficient administrative structures, competitive salaries and opportunities for professional development were among the factors associated with high attendances. Underpaid members of staff are forced to take on extra work to supplement their income, leading to extended periods of absence (Mizala and Romaguera 2005). Inefficient salary payment systems sometimes result in teachers abandoning their classes and travelling long distances to collect their salaries (Lockheed and Verspoor 1991). In Uganda the fact that teachers were expected to teach more students for the same amount of pay after the introduction of free primary education meant that their salaries were effectively reduced. The inclusion of organisational elements into the study of primary school quality in Africa is still fairly new, and one of the gains of this thesis will be to add this dimension to a model of school effectiveness and equity. In the next section I present the conceptual framework and the research questions that will be addressed in the remaining chapters.

2.5 Conceptual Framework

Thus far, I have described the many different ways in which the educational domain can influence the academic achievement of students. I have also described how certain school characteristics are reported to be more successful than others in reducing inequality between students within a school. In this section I present the general model of how the different school effects are related to academic achievement and its distribution. It is based on the literature reviewed above and relates to the specific research questions that I will address. In Figure 2.1, the boxes on the left summarise different categories of student characteristics and school effects that I have already detailed. On the right I show the two student outcomes that I will use in different chapters of the thesis. In Chapter 3, I will provide further details about how measures are derived from the survey data. In this section I present a general overview of the relationship between different dimensions of schooling. I have already discussed in the literature that differences related to gender and mathematics achievement are likely to favour boys. The mathematics outcome will be used to explore this relationship in Kenya, Tanzania and Uganda. The reading achievement outcome will be used when I consider SES-achievement differences in Uganda in the period immediately after their primary education system had been extended.

Student Characteristics – Typically, a student's socioeconomic status and academic background have been the focus of attention because of their consistent association with academic achievement. The socioeconomic status of a student represents the physical and human resources that are available to support learning. Students with a stronger support system at home are more likely to perform well at school (arrow 'a'). Similarly, a student with a stronger support base (academic supervision outside of school) approaches a subject with an academic advantage. Students who have repeated a grade are likely to be weaker academically (arrow 'c'). Based on the literature review, boys are anticipated to outperform girls in mathematics achievement across the three countries studied (arrow 'b').

School Composition – School composition effects reflect the collective influence of students who attend a school on the academic achievement of students within the schools (arrow 'd'). Schools with a wealthier student population are likely to have a higher overall academic achievement because of wider access to learning resources both in school and at home. Similarly, the anticipated consequence of a school consisting of students who receive regular homework guidance is expected to be positive. Because the relationship between

student gender (female student) and mathematics achievement as well as student grade repetition and achievement is likely to be negative, it follows that the aggregate effect of gender composition and grade repetition at the school level will also be related to lower average achievement scores. More girls and a higher proportion of repeaters in the school are likely to lower the average achievement level of the school (arrow 'd'). The factors that raise the academic quality of the school are the ones most likely to be conducive to reducing inequality within the school (arrows 'e' and 'f').

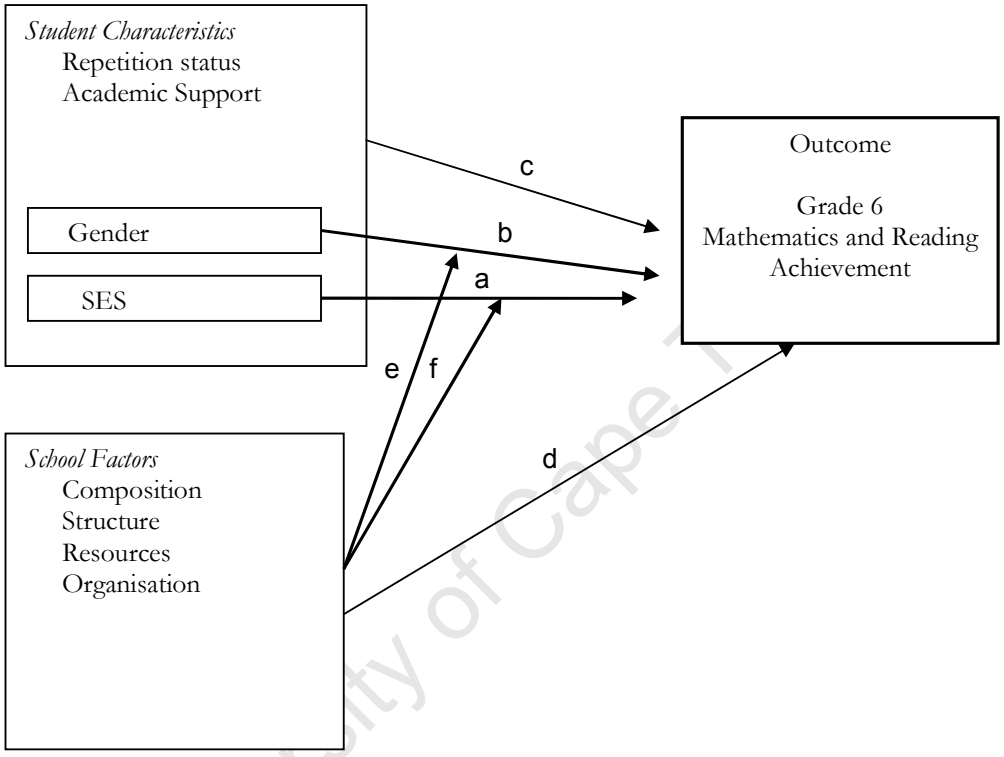
School Structure – Whereas the school composition variables reflect the characteristics of students who attends the school, school structure describes the school in its most fundamental terms, irrespective of the types of students in attendance. Here, I focus on average class size, school location and school sector. Greater attention to individual students and lighter teaching loads would mean that smaller classes are known to be more conducive learning. Urban schools and private schools are expected to have an academic advantage over rural and government schools (arrow 'd'). Because less affluent students and girls are expected to benefit more from improvements to school structure, the effect on equity is expected to be positive (arrows 'e' and 'f').

School Resources – I consider physical and human resources separately. Physical resources represent the facilities available in the school. Human resources are defined in terms of the professional and academic background of Grade 6 teachers and their subject matter knowledge of the material that they teach. The availability of learning resources has been consistently associated with better and more equitably distributed test scores, and this study is expected to provide further evidence of this tendency. Heavier workloads brought on by expanded access to education in Uganda are anticipated to impact negatively on educational quality (arrow 'd') with more serious effect on student who have fewer academic options (arrow 'f').

School Organisation – I define school organisation as the processes through which the school organises the learning climate. I anticipate that an ordered environment that is characterised by minimal attendance and behavioural disturbances and active teacher and community involvement will be more effective (arrow 'd') and equitable (arrows 'e' and 'f'). The active participation of the community in the school's affairs would at the very least

increase levels of accountability among staff, and possibly ease certain burdens from school administrators.

Figure 2.1: Conceptual Framework



2.6 Research Questions

With the above conceptual framework in mind, this thesis sets out to answer a series of research questions within the context of three East African countries. The first category of questions addresses the background of primary school students attending East African schools. The second category considers the characteristics of schools that influence their educational outcomes. The third group of questions focuses on the gender gap in mathematics achievement in the three study areas. The final set relates to Uganda. It addresses the issue of reading achievement and the social distribution of learning after primary schools had become more accessible in that country.

Student Background and Academic Achievement

a) *What types of students in Kenya, Tanzania and Uganda are most at risk of poor academic results in mathematics?*
b) *What is the relationship between student background characteristics and academic success?*
c) *Is there a pattern to these characteristics across countries?*

School Effects and Average Mathematics Achievement in East African Primary Schools

a) *What characteristics of schools are associated with mathematics achievement across countries?*
b) *How does the relationship between school effects and average academic achievement compare across countries?*

School Effects and the Gender Gap in East African Primary Schools

a) *What is the magnitude of the gender gap in the three countries in Grade 6 mathematics?*
b) *What characteristics of students and schools are associated with the gender gap in mathematics achievement in the three countries?*

Average Reading Achievement and the Social Distribution of Learning in Uganda

c) *How do student background characteristics relate to reading achievement in the context of free primary education?*
d) *Is the presence of various forms of resources associated with average reading achievement?*
e) *To what extent does the equitable distribution of achievement based on socioeconomic status relate to the availability of resources in a school?*

2.7 Summary

The reality of primary level education in Africa is extremely harsh and the challenges that students must overcome to obtain a decent level of education are many. Typically, the majority of students in developing countries attend government schools, schools that face enormous challenges as they stretch meagre resources to educate students who live in conditions of poverty, while simultaneously addressing the needs of students who are at greatest risk of failure. Some schools do so quite effectively. International evidence differs about the best way for schools to raise their standards. Often different research designs present contradictory results when investigating the same characteristic of schooling, even when studies are conducted in the same country and during a comparable period of time. Class size has been studied extensively and has provided a vast array of findings in both developed and developing countries. The resource base of schools, on the other hand, reflects a more consistent association with raised educational quality and equitable distribution of achievement results.

Recently, researchers have turned their attention to how the presence of resources may coincide with the organisational efficiency of schools. Studies of school organisation are still relatively new in African countries, especially for primary schools, but the evidence that does exist is promising. In the following chapters, I will apply my general model of school effectiveness to four groups of questions about how the characteristics of students and schools in East African countries relate to educational quality, and how school systems can be modified to best serve students with the greatest academic difficulties. I will also reflect on the extent to which results are comparable across three countries with strong ties, what Buchmann aptly describes as walking "the fine line between sensitivity to local context and the concern for comparability across multiple contexts" (2000, p.168). Before I estimate my models, I need to provide details of my data and a general introduction to multilevel analysis.

CHAPTER 3:
DATA, SAMPLE AND METHODS

3.1 Introduction

Data for this thesis are sourced from the second wave of a cross-national research project conducted by the Southern and Eastern African Consortium for Monitoring Educational Quality (SACMEQ)[10]. The SACMEQ consortium was launched in 1995 and represents fifteen Ministries of Education[11] in Eastern and Southern Africa. SACMEQ II data were collected between September and December 2000 (October in Kenya and Uganda, November in Tanzania). The main purpose of the SACMEQ study was to evaluate the quality of primary level education across a selection of African countries. A representative sample of students, teachers and school principals from each country completed questionnaires. In addition, a selection of students and their teachers took part in a literacy and numeracy assessment. These data make it possible to pursue a research design that considers the influence of the education domain on scholastic achievement, while controlling for students' background characteristics. There is also the potential to explore the interaction between the school environment and the distribution of achievement between different groups of students. The SACMEQ study draws on the strengths of cross-national surveys while accommodating each country's competency threshold. The study design uses similar survey instruments across countries to facilitate international comparison. To increase local relevance, the scales derived from the SACMEQ data are matched to the proficiency targets identified by local experts (Grisay and Griffin 2006).

A multistage sampling procedure guided the collection of SACMEQ data and details will be provided in this chapter. Whereas the academic achievement outcome variable referred to each individual student, many of the important predictors of academic achievement referred to the school. Multilevel analysis (also called hierarchical linear modelling) addresses this incompatibility and is the appropriate methodology for the analysis of the data within this structure. In recent decades, progress has been made in developing software and formalised techniques to estimate multilevel models. Several authors have demonstrated the importance of multilevel analysis in educational research across various settings (Fuller and Clarke 1994; Hox 2002; Lee and Bryk 1989; Lee and Smith 1995; Lee et al. 1997; Luke 2004; Raudenbush and Bryk 2002; Snijders and Bosker 1999; Willms and Somers 2001). In this chapter I report details of the SACMEQ II survey.

I also describe the variables that are used in later chapters and how they compare across countries. I present the rationale behind the multilevel methodology and introduce the comparative model of school effectiveness.

3.2 The Southern and Eastern African Consortium for Monitoring Educational Quality (SACMEQ)

3.2.1 Description of the SACMEQ Data

In Chapter 1, I explained the reasons behind pursuing questions of effectiveness and equity in Kenyan, Tanzanian and Ugandan primary schools. One underlying reason is their colonial educational inheritance. From a historical perspective, they formed part of the British East African protectorate and were governed by the same colonial educational policy that segregated the delivery of education based on racial classification. In the period after gaining independence from colonial rule, governments in each country recognised the immense importance of expanding educational opportunities especially to marginalised groups. A combination of external events and internal mismanagement caused severe setbacks to their education systems. Recently, the three have joined an international chorus in support of affordable and accessible primary education. Some of the challenges facing educational policy makers in each country are the same. How to make schools better places for learning to take place remains an enduring concern and I have detailed the literature on school effectiveness in Chapter 2. Equally important is how to narrow achievement gaps between different groups of students. In all three countries, boys outperform girls in primary level mathematics on average. Achievement differences based on student socioeconomic status are another central issue, especially where education systems have expanded and a greater proportion of poorer students are attending school. It is instructive to compare which characteristics distinguish the sample of students and schools in each country.

SACMEQ data collection was guided by information gathered and routinely updated by education officers for their administrative purposes. For example, the national sampling frames already contained information on Grade 6 student enrolment, school names and the physical location of schools for each country. Survey staff stratified schools into education regions before selecting the sample of schools that they would visit. It is widely acknowledged that stratification can increase the accuracy of education surveys and is useful for reporting results for sub-population groups (Murphy and Schulz 2006). The use

of regions for stratification purposes also ensured that sampled schools were spread widely across each country. There were eight education regions in Kenya, eleven in Tanzania and five in Uganda[12]. After stratification schools were selected with a probability that was representative of each school's size. This gave schools with a larger student population an increased chance of selection.

Data collectors then drew a simple random sample of twenty Grade 6 students from within each school. In their selection of students at any given school, data collectors ensured that they had access to all Grade 6 class registers so that each student had an equal opportunity of participating in the survey. To avoid sampling biases, students who were absent were not replaced. In addition, survey staff chose Grade 6 teachers in each school to take part in the survey. The entire sample for SACMEQ II was 41,686 students from fourteen countries in 2,305 schools. The samples for the three countries in this study totalled 8,792 students in 529 schools. The number of teachers surveyed varied from school to school and from country to country. The limited number of Grade 6 teachers per school (usually one or two) prevented estimates of differences in student achievement based on teacher characteristics being made with any accuracy (de Leeuw and Kreft 1995). Therefore, where necessary, I aggregated relevant teacher variables to the school level and used these values to represent the average Grade 6 condition at the school. The targeted response rate for SACMEQ II was 80 per cent for students within schools. In general, this response rate was achieved, although Tanzania fell slightly short with their student response rate of 77 per cent. Student response rates for Kenya and Uganda were 89 and 81 per cent respectively.

The desired target population for the SACMEQ surveys consisted of all Grade 6 students who were attending either government or non-government schools in the first week of the eight month of the academic calendar (Ross et al., 2005). Grade 6 was considered the best choice for several reasons. First, this grade represented a point in primary school where enrolment was still relatively high. Second, the Grade 6 level allowed sufficient time to lapse between the early grades of teaching in local languages in most SACMEQ countries and the switch to instruction in the official national language. Finally, Grade 6 students were considered mature enough to provide accurate self reports about living conditions. This information was especially important for developing a summary scale of socioeconomic status (Ross et al. 2005). Certain schools (schools for the handicapped and very small schools with less than twenty students) were deliberately omitted from the target population because of logistical and financial constraints. These

types of schools were usually situated in isolated and remote areas. The cost of including them far outweighed the value that they would add to the survey. In most cases, their omission resulted in negligible reductions to the final sample: 3.7 per cent in Kenya, 3.4 per cent in Tanzania and 3.6 per cent in Uganda. Some countries had more stringent exclusion criteria. For example, Kenya excluded schools with less than fifteen Grade 6 students and Uganda also excluded schools in areas of heavy military activity. After the data files had been cleaned and combined, sampling weights were calculated to adjust for differentials in missing data and the variation in selection probabilities.

Table 3.1 summarises information on the number of regions, districts, schools and students included in the East African country samples. It also presents the gender breakdown of students in the sample, and the enrolment rates at the time of the survey. Kenya and Tanzania sampled considerably more schools than did Uganda. Because the literacy and numeracy exercises were completed on different days, a handful of students were absent on the second day, when mathematics testing took place (3 absences in Kenya, 5 in Tanzania and 23 in Uganda). However, there was no systematic gender pattern to the absences that would suggest that girls were absent because of test anxiety (Dweck 1986). The 3 absent students in Kenya were all boys. In Tanzania and Uganda the number of absent students was half male and half female. Table 3.1 also reports on the enrolment figures for primary school in the survey year. Unsurprisingly, the net enrolment ratio was highest in Uganda, where Universal Primary Education had already been introduced but Kenya was not far behind with 87 per cent of students of primary school age enrolled in school. Tanzania's enrolment was noticeably lower than the other two, with just over half of primary school age students attending school.

Table 3.1: Background of Schools and Students in East Africa during the Survey Period

	Kenya	Tanzania	Uganda
Number of Education Regions	8	11	5
Number of Districts	57	70	42
Number of Primary Schools Sampled	185	181	163
Actual Student Sample Size	3299	2854	2642
Sample for the Mathematics Test	3296	2849	2619
Proportion Female	0.49	0.52	0.44
Net Primary Enrolment in Education[a]	87	59	89

a. Data Source: (Byamugisha and Ssenabulya 2005; Mrutu et al. 2005; Onsomu et al. 2005; World Bank 2002)

3.2.2 Advantages of the Data

One of the distinguishing features of the SACMEQ II literacy and numeracy tests is that it has been scaled with Item Response Theory to allow for meaningful comparison across SACMEQ countries. The scale includes test scores from all students in the SACMEQ region who took part in the survey and because overlapping items from other assessment exercises form part of the test, it is also possible to compare SACMEQ II test results to the results of an earlier SACMEQ project[13]. Similarly student and teacher test scores can be compared as can educational quality in SACMEQ countries and in countries that took part in International Association for the Evaluation of Education Achievement (IEA) studies. For further information on the test construction and scaling procedure, refer to Ross et al. (2005). Another advantage of the test design is that because the SACMEQ tests were constructed for a known target population, test items reflected what was being taught in Grade 6 classrooms at the time. Representatives from SACMEQ countries met and consulted textbooks, curricula and examinations to ensure that what was included in the tests was suitable. The local relevance of the research project was further extended in

some countries, where English was not the official language. Mainland Tanzania is one of three locations that used a translated version of the survey[14]. All survey instruments were translated into Kiswahili. To ensure consistency, they were back translated from Kiswahili to English and the two English versions were then compared.

The survey also benefited from international standards followed in the sample design, which were based on education surveys conducted by the IEA (Foy and Joncas 1999). It is also worth mentioning that as an extra precaution, only data collectors were involved in selecting the sample of twenty students in each school. This removed any bias that would have arisen if teachers chose their best students for assessment.

3.2.3 Limitations of the Data

There are some limitations to the SACMEQ data that must be pointed out. The SACMEQ study, like many recent education surveys (PISA and TIMMS are two good examples), is cross-sectional in design. Because learning is a cumulative process, the absence of longitudinal data in these studies places certain constraints on the interpretation of the results. Without adjustments for prior achievement levels and the school environment in earlier grades, it is impossible to make any causal claims about the relationship between school quality on the one hand and educational outcomes on the other. The point to be made here is not that cross-national surveys are without value, but rather that researchers should be encouraged to interpret the data in a manner that shows an understanding of existing limitations. For example, Raudenbush and Kim have suggested that a more realistic approach is to use cross-national surveys such as these to determine possible causal explanations that can then be verified in experimental trials (Raudenbush and Kim 2002). The inclusion of a pre-test at the beginning of the testing year is certainly a methodological step in the right direction but it is not entirely sufficient. In fact, it can prove to be counter-productive for education assessments if teachers become aware of student pre-test scores and use this information to adjust their teaching methods temporarily (Raudenbush and Bryk 2002). Moreover, the schooling environment in early primary school can still affect children much later in their academic careers (Nye et al. 2004) and understanding this relationship requires data to be collected regularly across many years.

Later in the chapter, I describe an innovative statistical technique for data and questions that are hierarchical. It is important to mention here that multilevel models will not resolve flaws within the data. For example, an unreliably measured dependent variable

will misrepresent the distribution of variation, irrespective of what statistical technique is used. Moreover, the amount of variation that is explained by including variables to a model will still be far less with cross-sectional data than it would if longitudinal data were used.

Another drawback relates to the level of primary school enrolment at the time of SACMEQ II. The exclusion of some students (especially in Tanzania) may lead to biased estimates of both academic achievement and the gender gap in achievement because the students who were not enrolled in school are likely to live in the most desperate conditions with less access to academic support (Colclough et al., 2003). Even in Uganda where, theoretically, UPE was on course and enrolments had increased dramatically, there were children out of school. In addition to possible sample biases, the student background data lack information regarding student attitudes about what they learn at school. This type of information has been used in the past to generate attitude scales and has been employed extensively in studies of gender differences in academic achievement (Fennema and Sherman 1977; Keeves and Kotte 1992). The level of academic support outside of school may shed some light on this issue because children with more support for their studies are likely to have a more positive outlook about learning in general. However student attitudes are constructed gradually through complex socialisation processes that take place both at home and in the school (Dweck 1986; Fennema and Sherman 1977). This type of information is best collected as part of the student survey.

3.3 Education Measures from the SACMEQ Data

3.3.1 Dependent Measures

A detailed description of how source variables from the original SACMEQ dataset were transformed and coded for use in this thesis can be found in Appendix 3.1 at the end of this thesis. In this section I highlight some important points about the measures used and how the three school systems compare. As mentioned in Chapters 1 and 2, my motivation for using mathematics achievement in the cross-country study is because of interest in exploring the school's role in overcoming the persistent female disadvantage in this subject area. The inability of girls at the primary school level to achieve competitive results in mathematics when compared to boys may seriously restrict their career choices later in life. Economic circumstances are the most often cited reason why Ugandan students were not in school in recent periods (Colclough et al., 2003). In the separate

chapter on Uganda after implementing educational reforms, I will be looking at ways of closing the achievement gap between high and low socioeconomic status (SES) students because the introduction of free education narrowed gaps in primary school enrolment between rich and poor (Deininger 2003; World Bank 2002). Certain schools are able to address the challenges of teaching students living in abject poverty and assist them to fulfil their academic potential. I focused on the results of the Grade 6 reading achievement test to address questions related to social equity in Uganda.

The goal of the student mathematics test was to assess as practically as possible how well students understood different dimensions of mathematics. Specifically, the definition of mathematics literacy was "the capacity to understand and apply mathematical procedures and make related judgements as an individual and as a member of the wider society" (Ross et al. 2005, p.78). The corresponding definition for reading literacy was based on the IEA reading literacy study and involved "the ability to understand and use those written language forms required by society and/or valued by the individual" (Elley 1992, p.17).

Although the tests themselves were based on standard domains from the IEA, these domains were modified to correspond with what was actually being taught in SACMEQ schools. For mathematics, three domains were created out of the original five: number, measurement and space-data (a combination of the geometry and space domains in the IEA framework). One other domain (algebra) was dropped because it did not apply to the Grade 6 level in SACMEQ. The reading tests covered narrative prose, expository prose and documents. Narrative prose assessed a student's grasp of a straightforward narrative. Expository prose tested the understanding of text with descriptions and explanations. The documents domain assessed whether students could deduce facts based on different pieces of information within the text. The literacy and numeracy tests were each standardised to a SACMEQ average of 500 and a standard deviation of 100 across countries.

3.3.2 Student Characteristics

Social Background

In addition to the outcome variables, I used several variables to capture student characteristics. Student background variables are necessary for making suitable adjustments before measuring the net impact of school characteristics on educational quality. I used three measures of student social background. The first identified the gender of Grade 6 students. This was also the variable of focus in the gender-equity analysis. Correspondingly, I used a composite measure for student socioeconomic status as the focus variable in my analysis of social equity and a control variable in the gender-equity model. The SES variable in the SACMEQ data archive included information on: parental education level (mother and father's education), household assets (newspaper, magazine, radio, tv, vcr, cassette player, telephone, fridge, car, water, electricity and a table) and the structural quality of a student's house (the main source of light in the home, the material used for the floor, walls and roof). A separate composite measure captured the level of academic support that students received while at home. This was a mediator variable in the gender-equity research and comprised information on whether a student had access to a family member who would ensure that homework was completed, whether a student could ask for help from a household member, whether a student was expected to practice reading and mathematical tasks for someone at home, whether anyone asked students questions about what they were learning at school and whether anyone looked at work completed while at school. Higher values implied a higher level of support. I standardised the continuous independent variables so that the results could be interpreted in terms of standard deviation units. Further details can be found in Appendix 3.1 at the end of the thesis.

Academic Background

In all the analyses, I used the repetition history of students as a control variable to represent student ability.

Comparison of Students in East African Schools

It is useful to compare student characteristics across countries. Table 3.2 displays student variables for the purpose of making relative comparisons. Average mathematics achievement is above the SACMEQ mean of 500 for all three countries meaning that for the region as a whole the performance of East African countries is quite favourable.

Kenyan mathematics results are considerably higher than the other two countries. Kenyan students are also at an advantage in terms of average wealth, whereas Tanzanian students are the poorest. Grade repetition history is unique to each country. It is less widespread in Tanzania than it is in either Kenya or Uganda but this can be explained by the policy of automatic promotion in Tanzania (Colclough et al., 2003). Nearly two-thirds of Kenyan students and over half of Ugandan students have repeated a grade at least once compared to less than a quarter of Grade 6 students in Tanzania. This could also reflect a higher drop-out rate in Tanzania among academically weak students (Colclough et al., 2003). Conversely, a culture of academic support is most common among students attending school in Tanzania and is less prevalent in Kenya and Uganda.

Table 3.2 also shows how significant are the differences between countries based on student characteristics. The first comparison is between Ugandan students and students from Kenya and Tanzania combined. The second contrast is between Kenyan and Tanzanian students. It is quite clear that there are important differences in student performance and in student background characteristics across countries that are worth pursuing.

Table 3.2: Characteristics of Students in East African Countries

	Kenya	Tanzania	Uganda	Significance of Contrasts[b]
Student Sample Size[a]	3296	2854	2619	
Grade 6 Maths Achievement	563.25	522.40	506.28	A***B***
Socioeconomic Status	0.34	-0.23	-0.17	A***B**
Proportion Female	0.49	0.52	0.44	A***B***
Proportion Academic Support	0.00	0.16	-0.18	A***B***
Proportion Grade Repetition	0.64	0.23	0.53	A***B***

a. Unweighted sample size.
b. I tested mean differences as contrasts under a one-way ANOVA: A: Uganda vs. Kenya and Tanzania; B: Kenya vs. Tanzania. ~ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

3.3.3 School Characteristics

I provided explanations for the choice of variables and their categories when introducing the conceptual framework in Chapter 2. In this section, I link the generic descriptions given there to the specific measures created using the SACMEQ data. Details of variable names and how I constructed these measures are presented in Appendix 3.1.

Measures of School Composition

School composition effects refer to peer influences on academic outcomes. I captured socioeconomic compositional effects with a standardised measure of the average socioeconomic status of the Grade 6 students within a school. Similarly, I represented the concentration of female students in Grade 6, the average number of repeaters and the prevalence of academic support outside of school as aggregated and standardised measures based on the samples. Schools with more affluent students, less repeaters, and with students who were better prepared by members of their household are more likely to achieve better academic results (Entwisle et al. 1997; Lee et al. 2005). Because of the known gender disadvantage of girls in maths across the region, a higher concentration of girls in co-educational schools was likely to be related to lower math test scores (although the dispersion of scores could be narrower).

Measures of School Structure

I mentioned in Chapter 2 that a school's structural features refer to its essential building blocks, irrespective of the characteristics of the students within the school. Several empirical studies have shown the important link between school structure and student performance, often because it can create an enabling environment for effective organisational practices (Bryk et al. 1993; Lee and Burkam 2003). One widely researched structural dimension is school sector. SACMEQ data contain information on whether a school is designated as either government or private. No further information on the type of private school was collected. Moreover, the majority of SACMEQ schools were government owned. In this sample of countries, less than 5 per cent of Kenyan students and less than 7 per cent of Ugandan students attended private schools. There was not a single private school in the Tanzanian sample. Therefore, I controlled for school sector only in the countries where it was relevant.

A measure of urbanicity classified schools based on whether they were situated in large towns or in other locations. Schools situated in urban areas are known to be more modern, to have better access to facilities and to attract better teachers. Moreover, the influence of class size is likely to be stronger in urban locations, making this variable a useful moderator for class size effects (Lockheed and Verspoor 1991). Although the evidence on class size is mixed and the relationship to education outcomes is sometimes curvilinear, the literature from developing countries seems to suggest that where a negative relationship exists between crowded classes and academic performance, its effect is usually most visible at the pre-primary and primary school stages (Michaelowa 2001; Willms and Somers 2001). Although school size is another important learning context, it remains an area of particular interest at the high school level partly because of policies aimed at consolidating high schools in order to improve efficiency (Darling-Hammond et al. 2002; Haller et al. 1990; Lee and Smith 1997). The education experience at the primary level revolves around the classroom. Therefore, I chose to concentrate on class size effects because of the stronger influence of the classroom environment at this level (Ready and Lee 2006). Often students remain in the same classroom for all of their lessons for the entire academic year. I used information from the teacher questionnaire to estimate the average size of the Grade 6 class and standardised it.

Measures of Human and Material Resources

I created and standardised a composite measure of school physical resources that consisted of information on the availability of school facilities. Schools with more physical resources have been shown to have an advantage in terms of achievement and equity, especially in low-income countries (Fuller 1987; Heyneman and Loxley 1983; Lockheed et al. 1986). I expected the marginal benefit of resource availability to be greater for disadvantaged students because presumably they had a smaller pool of resources available to them outside of school. I created a measure of teacher workloads based on the average number of hours taught by Grade 6 teachers in the school. I expected heavier workloads to be identified with poorer educational outcomes. I also considered other estimates of resources, such as teacher quality and the type and availability of sanitation facilities. However these constructs were unrelated to either school average mathematics achievement or the gender gap and were eventually dropped. I must emphasise here that this should not lead to the conclusion that that these types of resources are unimportant.

Instead, what this suggests is that any variation in the average values of these alternate resource measures is unrelated to the variation in the outcome of mathematics achievement in the study areas (Raudenbush and Bhumirat 1992).

Measures of School Organisation

School organisation may also contribute to a healthy internal school climate and promotes the academic development of its students. I based my measures of non-academic organisation on factors that represented relationships between community members, staff and students. I selected suitable responses to questions about community involvement in school affairs, teacher absenteeism and the disciplinary climate within the school from the school head questionnaire. I based community variables on the school head report of community help in maintaining the school's resources and their contribution to student meals. A composite variable for teacher attendance problems contained information about unjustified absence. It also relied on the school principal's report and was standardised. Variables for teacher behavioural problems were based on the principal's reports about intimidation, sexual harassment, and drug abuse. Greater levels of community involvement and a more orderly climate within the school are perceived to provide a safer and more conducive environment for learning (Jimenez and Paqueo 1996; Lockheed and Verspoor 1991).

Comparison of East African Schools

In Table 3.3, I present the characteristics of schools in the sample. Details of how I constructed each variable can be found in Appendix 3.1. Many variables follow a similar pattern to the student data. The average school socioeconomic status and the school resource base are highest in Kenya and lowest in Tanzania. Across the region, the majority of schools are situated outside large urban centres. In Uganda, virtually all schools are situated in either small towns or rural areas and this contrasts significantly to the location of schools in Kenya. The average Grade 6 mathematics class size falls within quite a narrow range of between 37 and 40 students per class. Moreover class size differences are especially significant between Tanzania and other countries in the region. It is slightly puzzling that classes in Uganda are less crowded than in the other countries because this is one of the areas that suffer the most when the demand for education increases dramatically. Some researchers have suggested that in the early years of UPE, crowded

classrooms were more prominent in the first and second grades of primary school. It is quite possible that the impact of large classes had yet to filter through to the Grade 6 level (Colclough et al., 2003). Community support varies considerably across countries as well. In Uganda, for example, the percentage of communities that provide support to student feeding programs is more than twice what is found in other countries. When it comes to support for building and maintaining school facilities and for remunerating staff, this is fairly rare in Uganda and quite widespread in Kenya. Teacher absenteeism is a more serious problem in Kenya and Uganda and reports of poor behaviour among teachers stand out in Uganda.

Table 3.3: Characteristics of Schools in East African Countries

	Kenya	Tanzania	Uganda	Significance of Contrasts[d]
School Sample Size[a]	185	181	163	
Average SES[b]	.45	-.28	-.21	A**B***
Repetition (%)	58	24	53	A***B***
Female (%)	49	52	44	A***B*
Academic Support[b] (%)	-.01	.31	-.33	A***B**
Urban Location (%)	24	12	7	A**B**
Average Class Size	37	40	38	B*
School Resources[b]	.43	-.41	-.02	B***
Community Support for Student Meals	-.14	-.19	.37	A***
Community Support for School Resources	.76	-.01	-.85	A***B***
Teacher Behavioural Problems[b]	-.23	-.08	.35	A***B*
Teacher Attendance Problems[b]	-.30	.08	.25	A***B***

a. Unweighted sample size.
b. In this table, these constructs are in a standardised (z-score) metric, mean (M)=0, standard deviation (SD)=1 across countries. For the multilevel analysis, they are standardised separately within each country.
c. Percentage Grade 6 students who receive mathematics homework on most days.
d. I tested mean differences as contrasts under a one-way ANOVA: A: Uganda vs. Kenya and Tanzania; B: Kenya vs. Tanzania. ~ $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

In the previous sections, I have presented the descriptive results that apply to the cross-country study of education because the results of the cross-country school effects model follow immediately in Chapter 4. I have discussed how characteristics of students compare across countries. I have also shown that mean differences between country groupings are important and how these characteristics need to be controlled for in further analysis. For ease of flow, I combine the descriptive analysis and the HLM results for the separate study of Uganda in Chapter 5 when I take a closer look at the social distribution of achievement in the context of mass education. In the next section, I detail the multilevel methodology that will guide the study of school effectiveness and equity for the remainder of the thesis.

3.4 The Need for Multilevel Analysis

Multilevel analysis (also referred to as Hierarchical Linear Modelling or HLM) is a statistical technique increasingly used in the social sciences when data have a nested structure (Bryk and Raudenbush 1992; Hox 2002; Snijders and Bosker 1999). The use of multilevel modelling in this thesis is necessary for two reasons that relate to the research themes raised and the data used. First, all of the research questions that I pursue in this thesis focus on how characteristics of schools might influence students' achievement. In this thesis, I investigate what elements of the school domain are related to a) raising student performance in curriculum-based tests and b) reducing inequality in student achievement between girls and boys and between students of different socioeconomic backgrounds within the same school. Second, the data used to address the topics of educational quality and distributional equity are hierarchical.

The SACMEQ II project collected information on students who were enrolled in specific schools and therefore the data possess a natural hierarchy. Some of the variables that I described earlier refer to students (socioeconomic status, academic support outside of school, gender and repetition history). There are other variables that are aggregated from student variables (the average socioeconomic status of students or their gender composition). Still other variables directly reflect the conditions of the school (such as the availability of resources, or location of the school). As a statistical tool, HLM overlaps with traditional regression in some ways but it goes further to correct for many of its limitations.

3.4.1 Similarities between HLM and Single-Level Regression Techniques

Not everything in HLM is new and many statistical fundamentals remain in place. For example, there are several assumptions that would underpin a traditional regression analysis of these data: that the predictor variables are unrelated; that a linear relationship exists between the outcome variable on the one hand and the predictor variables and residual disturbance term on the other; and that residual terms are independent of one another and are normally distributed, homoscedastic and with an average value equal to zero. Multilevel models retain many of these qualities. Just like standard regression, linearity remains a priority and because many of the test statistics require normally distributed variables, this feature remains important.

3.4.2 Some Statistical Issues in Multilevel Modelling

One distinguishing feature of multilevel analysis is that it incorporates a more precise treatment of the relation between variables. It avoids compositional and ecological fallacies that are present if single-level regression analysis is applied to questions and data of this kind (Keeves and Sellin 1990). These errors occur when researchers draw conclusions about groups by using individual-level data and make inferences about individuals based on group-level data. A variable can have a completely different meaning depending on the level to which it refers. A good example is socioeconomic status. At the individual level it represents the educational resources available to a student at home. At the school level it reflects the resource wealth of the student body as a whole and the social class climate that they generate. There are some serious drawbacks to using traditional regression analysis for this line of research and multilevel methods attempt to correct for them.

Identifying the Proper Unit of Analysis

As early as the 1970s, statisticians cautioned researchers to pay more attention to the analysis units for the data used in their regressions (Cronbach 1976; Knapp 1977). If researchers persist with applying the wrong statistical techniques to questions of this nature, they risk violating certain statistical assumptions and reducing the strength of their research findings. In the past, where school characteristics have been used as predictors of individual student achievement, researchers have disaggregated the data for the school so that each piece of information that describes the school is assigned to each student within the school. On the surface, this approach appears harmless enough because one could

argue that learning conditions in the school may affect each student uniquely. It has certainly been the method of choice in many influential papers of educational quality in developed and developing countries (Coleman et al. 1966; Heyneman and Loxley 1983; Lockheed et al. 1989b). However, analysing multilevel data in this way has its pitfalls and may result in misleading conclusions about school effects.

Disaggregating data inflates the actual sample size. Any statistical test will assume that the disaggregated data are independent. Data are not independent because characteristics of the school are the same for individuals attending the same school. These students are exposed to the same learning environment and therefore actually provide less information for the analysis than they would were they randomly assigned to schools. Insights into the effect of school characteristics on education achievement may be exaggerated if traditional regression is employed.

An alternative is to aggregate student variables to form average values for the school (Heyneman and Jamison 1980). This approach has been the subject of vocal criticism (Burstein 1980). There are a number of reasons why aggregation should be avoided. By aggregating data, several observations are combined into fewer higher level units and the power of the analysis is reduced. The within-group variation is discarded and in some cases, this constitutes a considerable proportion of total variation (Raudenbush and Bryk 2002). It has been shown that correlations at aggregated levels can be much stronger than at the individual level and that depending on at what level the total variance is concentrated, coefficients at different levels may even have opposite signs (Kreft and de Leeuw 1988; Snijders and Bosker 1999)[15]. Each level of data is important and as far as possible must be retained at its original level. This is an important contribution of HLM.

Kennedy and Mandeville (2000) have detailed other attempts to accommodate different units of analysis. One such example is a two stage estimation method that generates separate estimates of a within-group model (i.e. for students within schools) and a between-group model (i.e. with school characteristics). It uses average values generated in the within-group estimate as predictors in the between-group models. However this method is flawed because it makes the unrealistic assumption that all regression slopes are homogenous. A similar logic is used in another two-step estimation approach that has received some attention. The first step consists of running separate regression analyses for each individual school. These regressions consist of a measure of achievement as the outcome and a student variable as a predictor. The slopes from these regressions are used as outcomes in the second step and school characteristics are used to predict variation in

these slopes. Though intuitively appealing, this 'slopes-as-outcomes approach' has many drawbacks. Raudenbush and Bryk (1986) have provided a detailed treatment of its deficiencies. The most serious problems associated with this technique relate to the limited sample size for students within schools, the difficulty in adjusting for other student level characteristics and the inability to disentangle sampling and parameter variance components.

Cross-Level Inferences

The application of multilevel analysis to education studies is gradually gaining momentum in developing countries. Part of the reason why it is so useful is that researchers can model the interactions between school variables that occur at a higher level and student characteristics that are situated at a lower level. This is an important consideration when researchers and policy makers are interested in how the school environment can influence scholastic development. The majority of HLM studies that have been undertaken using developing country data have used school characteristics to explain average achievement differences (Lee et al. 2005; Lockheed and Longford 1989; Nyagura and Riddell 1993; Willms and Somers 2001). Only a handful of researchers have gone further to investigate cross-level effects between school factors and student characteristics. This additional step avails an opportunity to address issues of quality and equity simultaneously. A good example of such a study was based in Botswana and tried to explain the female gender advantage in achievement. The authors used teacher characteristics to explain the gender gap in achievement (Fuller et al. 1994). In a separate study based on Brazilian data, Fuller and colleagues created cross level-interactions between school measures and gender as well as between school measures and student socioeconomic status (Fuller et al. 1999).

The Notion of Shrinkage

One of the more controversial elements of multilevel analysis is the concept of "shrinkage" or Empirical Bayes (EB) estimates which could lead to test scores from certain school being unfairly sanctioned[16]. In an effort to obtain a more accurate estimate of variation, the EB estimates consist of a weighted average of the OLS estimates. The extent of the shrinkage is determined by two factors: the sample size of the group and the degree to which the group estimate diverges from the overall estimate. Teddlie and colleagues

remind researchers that the test scores of smaller well performing schools are considered unreliable and shrunk towards the mean (Teddlie et al. 2001).

The Concept of Variance in Multilevel Analysis

The notion of variance is considered quite distinctively in multilevel analysis. The distributions of residual terms are treated differently for student and school variables. Student-level residuals are perceived in the same way as they are in traditional methods. Most importantly, these residuals are still assumed to be homoscedastic. If this assumption is violated, the value of school level estimators will be unaffected but the results will be inefficient and the standard errors of higher level coefficients will be biased (Hox 2002; Snijders and Bosker 1999). At the school level, the dispersion of residuals between school level estimates may differ. Some schools will have more variation than others. These differences in variation are used to address questions of quality and equality in education systems. School characteristics are identified that explain why average test scores are higher in certain schools. This is the focus of the section of the thesis that deals with educational quality. I also pursue explanations for gender differences in achievement that favour boys and socioeconomic differences that favour more affluent students. This is possible because in some schools these gaps are small (small achievement differences between girls and boys and between students of different social backgrounds) and in others they are large (large gender and SES gaps). The aim is to understand which education settings are related to greater equity between students and whether the same qualities that promote equity are simultaneously associated with improving educational quality in general.

The quality and rigour of HLM research in developing settings differs considerably. Researchers often ignore the value of constructing their multilevel models in a way that makes sense of their research questions. In the next section, I provide details of the procedure that I follow to arrive at my final models, how each model builds on a previous one and how the technique addresses my research themes.

3.4.3 Multilevel Models for this Thesis

Using the One-Way ANOVA with Random Effects

The multilevel models that ultimately address issues of effectiveness and equity in East African schools emerge through a specific model building sequence (Bryk and Raudenbush 1992). In this thesis, the outcome variable is a standardised test score for an individual student nested within a school. The first step is to generate a baseline or "empty" model. As the name implies, student and school predictor variables are excluded. This model is designed to establish whether there is systematic variation in the outcome variable and the proportion that lies between individuals within schools and between the actual schools. Like traditional regression it consists of a fixed component for the average achievement score of all schools in the sample (the average of all the school average test scores), γ_{00}, and a stochastic or random component that represents deviations from the mean. Two residuals are derived, one that estimates variation in Grade 6 achievement at the student level and one for the school level (r_{ij} and u_{0j} respectively). At the student level, this outcome comprises the average achievement for each school B_{0j} and a unique effect for each individual within a school r_{ij}. At the school level, the expected achievement for each school becomes the outcome and is characterized by the grand mean for the population and a random effect for each school. By testing this model and observing the structure of the variance, it is possible to partition total variation into individual and school level components.

Specifically:

$$Y_{ij} = B_{0j} + r_{ij}$$

$$B_{0j} = \gamma_{00} + u_{0j}$$

and substitution yields:

$$Y_{ij} = \gamma_{00} + u_{0j} + r_{ij} .$$

The variance estimates associated with the model above are used to calculate a measure of intraclass correlation (ICC). The ICC can be best described as a measure of the distribution of inequality between schools. The higher the ICC the larger are the systematic differences in achievement scores between schools. It can also be thought of as an estimate of correlation between two students from the same school who are selected at random (Hox 2002). The school level variation τ_{00} is estimated as a proportion of total

variation (student and school). Student variation is represented as σ^2 and the ICC (ρ), calculated as:

$$\rho = \frac{\tau_{00}}{\tau_{00} + \sigma^2}$$

This step generates important information about where inequality is concentrated: between students or between schools. The ICC ranges between 0 and 1. A higher value indicates greater differences between schools in academic achievement. It is only differences between schools that can be explained through a school effects model. Clearly, larger between-school variation will make it easier to isolate significant school effects. Running the fully unconditional model also creates a chi-squared statistic to test whether average academic achievement between schools is significantly different. A significant chi-squared test implies that there are more than chance differences between schools and that a multilevel pursuit that uses school characteristics to explain these differences would make sense.

The complexities associated with non-independent data have become a focal point of survey data analysis and certain calculations have been formalised to account for the loss of precision in the structure of the sampled population (Kish 1965). In theory, it should be possible to use these corrections to adjust for multilevel data. Unfortunately, the situation is complicated by the fact that the corrective procedures depend on the ICC of each variable in question and this differs from variable to variable. Students from the same school may have similar measures of wealth and yet the ICC for this variable may not necessarily be identical to another variable such as gender. It is not only individuals clustered within groups but the variables themselves that are also clustered. As Hox (2002, p.6) has commented:

> Combining variables from different levels in one statistical model is a different and more complicated problem than estimating and correcting for design effects. Multilevel models are designed to analyze variables from different levels simultaneously, using a statistical model that properly includes the various dependencies.

The results of the null model also produce an estimate of the reliability (λ_j). The reliability is a prediction associated with each school. It is a ratio of the variance of true scores to the variance of observed scores (Raudenbush and Bryk 2002). The true score variance is given by ζ^2 whereas the observed or total score variance is expressed as

$\tau^2 + \sigma^2 / n_j$. The size of each school cluster is n_j. Therefore the reliability of a school's average achievement score is:

$$\frac{\tau^2}{\tau^2 + \sigma^2 / n_j}$$

The reliability is important because as the cluster size increases for each school, the reliability estimate for each school approaches a value of 1. Similarly, if variation in each school's true score increases (holding cluster size constant), the reliability will be found to increase (Raudenbush and Bryk 2002; Snijders and Bosker 1999).

Using the Random-Coefficient Model

Research clearly indicates that ICC values for schools in the developing world are higher than those found in industrialised countries (Lee et al. 2005). However, although less readily responsive to public policy, the individual background of students also influences their education outcomes and warrants some attention. Students vary in many different ways – gender, socioeconomic status and educational background. Before I select school variables to explain achievement differences between schools, an interim step involves assessing the strength of the relationship between student achievement scores and student background characteristics. I use four student characteristics to capture social and academic background in the context of this study: student socioeconomic status, student gender, student repetition history (a proxy for academic background) and student academic support outside of school (a proxy for attitudes and interest in academic matters). These variables also act as controls for further model building so that school effects can be measured net of the influence of student characteristics. The random coefficients model can be generalised as follows[17]:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(REPETITION) + \beta_{2j}(SOCIAL\_BACKGROUND) + \beta_{3j}(FEMALE) + \beta_{4j}(ACADEMIC\_SUPPORT) + r_{ij}$$

$$\beta_{0j} = \gamma_{00} + u_{0j}$$

$\beta_{2j} = \gamma_{20} + u_{2j}$ (for the Uganda study)

$\beta_{3j} = \gamma_{30} + u_{3j}$ (for the East African gender equity study)

In the cross-country study of gender equity, the gender slope is left uncentred and allowed to vary (u_{3j} above) while other slopes are fixed. Single-sex schools will have no gender-based variation in achievement and will be automatically dropped from the analysis[18]. In

the Uganda social inequality study, the SES slope is centred on the school mean and allowed to vary (u_{2j} above) and the other slopes remain fixed. By allowing the slopes to vary, I am relaxing the assumption that schools have identical relationships between gender and mathematics achievement and between SES and reading achievement respectively. When these slopes are allowed to vary, a measure of reliability is generated. Typically, the reliability of a slope is lower than the reliability estimate for the intercept which makes identifying school factors to explain inequality more difficult than isolating school factors associated with quality. If the reliability of a slope falls below 0.05, it is recommended that such a slope be fixed (Raudenbush and Bryk 2002). The equations for the analysis of social and gender equity can be represented as follows:

$B_{2j} = \gamma_{20} + u_{2j}$ (For the study of social inequality)

$B_{3j} = \gamma_{30} + u_{3j}$ (For the study of gender equity)

Because socioeconomic status and gender are used to address issues of equity within schools, the issue of centring of the student level variables required careful thought. Appropriate centring decisions also prevent specification errors at higher levels and less disturbance to the student level model (Kennedy and Mandeville 2000). If student variables simply serve as controls for the school effects analysis, then it would be appropriate to centre these variables on the population average (grand mean for the entire national sample). If each student variable was centred on the population mean, then this would imply that all schools had identical average values for these factors and for any school in the sample, the average value would be equivalent to the estimated value of the intercept β_{0j} (Heck and Thomas 2000). But because socioeconomic status is centred on the school mean, then school level predictors would potentially explain SES differences in average reading achievement between students within the same school in Uganda.

The student variable for gender is a dummy variable and is coded '0' for boys and '1' for girls. Centring on the population mean would have created an intercept that was the expected value of the outcome variable for both boys and girls in the population as a whole. Centring on the school mean would be interpreted as the average value for the school. I use the uncentred value for gender which corresponds to the average value of mathematics achievement for boys in a school (the variable coded '0') so that school characteristics explain changes in the gap between performance of girls and boys.

Using the Intercepts-and-Slopes-as-Outcomes Model

The Intercepts-and-Slopes-as-Outcomes model involves including school level predictors. By adding these variables, we can derive an understanding of what characteristics of East African schools are related to narrower achievement gaps between different types of students (i.e. that reduce the gender gap and SES gap) and that also benefit academic achievement in general. I model the intercept to isolate factors that are related to academic achievement and I model the gender and SES slopes to address the issue of gender and social equity. Owing to higher achievement scores among wealthier students, the coefficient for SES is positive. Greater equity is therefore reflected by a negative sign on the interaction term between school characteristics and student socioeconomic status. The gender variable is coded '1' for girls and is negative because of the male advantage in mathematics. Narrowing the gender gap is represented by school characteristics with the opposite sign (a positive coefficient on the gender slope).

In the East Africa study, I carry out separate multilevel analyses of each country's data. I add groups of school variables sequentially with more fixed compositional factors preceding the inclusion of resource related and organisation variables. Variables that deal with the organisation of schools and classes are the last to be included. In the final step of model building, the models are re-run with only the factors that were significant in each individual country. I compare the amount of variance explained by the final model to the random coefficient model. This final step acts as an indicator of how well the final model explains differences between schools. The details will be provided in Chapters 4 and 5. For the Uganda study of social inequality I focus on resource related variables that were affected by the country's education reform and measures of school resources that are more extensive than in earlier studies. These details will be presented in Chapter 6.

The two-level multilevel model can be generalised as follows:

Student Level (Level 1): $Y_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \beta_{3j}X_{3ij} + \beta_{4j}X_{4ij} + r_{ij}$

School Level (Level 2):

$$\beta_{0j} = \gamma_{00} + \gamma_{01}W_j + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}W_j + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}W_j + u_{2j}$$

β_{0j} = the average academic achievement in each school;

$\beta_{1j} \ldots \beta_{2j}$ = the average value of each individual student predictor, X_{ij} namely SES, student gender, academic support or grade repetition;

where:

γ_{00} = the average value of academic achievement after adjusting for school-level predictors, W_j (namely, compositional, structural resource-related and organisational features of the school);

$\gamma_{10} \ldots \gamma_{20}$ = the average value of the student-level slope (gender) after controlling for the school-level predictor, W_j;

W_j = the school level predictor;

X_{ij} = the student level predictor;

γ_{01} = the effect of the school predictor on the intercept;

$\gamma_{11} \ldots \gamma_{21}$ = the effect of the school predictors on the SES and gender slopes;

u_{0j} = the unique effect of each school 'j' on average mathematics achievement while holding the effect of W_j constant;

$u_{1j} \ldots u_{2j}$ = the unique effect of each school 'j' on the student slope for gender and SES while holding the effect of Wj constant;

r_{ij} = the unique effect of each individual student.

3.5 A Comparative Model of Educational Quality

In this section I take a first look at cross-national analysis and propose some strategies for assessing the scope of comparative educational studies. Table 3.4 summarises a replicated model of school effects across all of the education systems that took part in SACMEQ II. To compare similar children, student-level controls that were introduced in Section 3.3.2 (socioeconomic status, gender, academic support outside of school and grade repetition) were also used here. I also used the same school variables that have been described in this chapter (categorised as compositional, structural, resource-related and organisational). It is a generalised version of the model that will be applied in later chapters of this thesis. The models presented here were run separately for each country and were designed to predict the relationship between a school's characteristics and average mathematics achievement (models of the intercept).

Each column represents the results for a single country. Countries are arranged in alphabetical order starting with Botswana on the left hand side. I leave a discussion of each country's regression results out of my purview because the intent of this section is to begin to unpack the capacity of cross-national school effectiveness research. Therefore I do not present coefficients or standard errors in this table. They are available in Appendix 3.2 through 3.4 at the end of the thesis. In Table 3.4, I summarise the patterns of effects across countries and the level of school-level variation that is explained by the saturated model. As stated earlier, there were several theoretical considerations that guided my selection of Kenya, Tanzania and Uganda for further analysis; what are sometimes described as strategic comparisons (Kohn 1987). I will discuss the particulars of these results in Chapter 4.

Several valuable points related to comparative educational analyses arise from this table. The first point is that with a comparable sample of students, similar indicators of educational quality (such as socioeconomic status) can be formulated. This is because measures of wealth are likely to be captured differently depending on where in the world they are identified. It would be unrealistic to use estimates of the physical structure of the home as part of a measure of socioeconomic status in many industrialised countries because the majority of students live in houses where these features are fairly uniform and of a reasonable quality. Because the differences in educational investments can be vast between high and low-income countries (Heyneman 2003), a very real consideration should be the economic realities of the countries being compared. Even among the

SACMEQ group, there is a range of economic situations represented but the spectrum is narrower than between industrialised and non-industrialised countries and the comparisons more realistic.

It is true that primary school enrolment rates in SACMEQ differed in 2000 and therefore school samples were not uniformly representative of the general Grade 6 student population. Net enrolments ranged from over 90 per cent in Malawi, Namibia, Seychelles, South Africa and Zimbabwe to below 70 per cent in Mozambique, Tanzania and Zambia (Ross et al. 2005). The SACMEQ group cannot claim to be entirely cohesive but members can be confidently identified as a cluster of developing countries in close proximity to one another with broadly similar educational commitments. From that perspective, examining inter-country differences in educational quality makes sense.

The second point is that school characteristics were related to academic achievement to varying degrees across the region. As earlier stated, the amount of variance in primary school mathematics achievement that exists between schools is called the ICC. ICC calculations for each country are shown in the bottom panel of Table 3.4. They were very high in some countries (Namibia, South Africa, and Uganda). This implied that the impact on achievement of going to one school compared to another was large there. In a few countries (Malawi, Seychelles and Zambia), achievement differences in test scores between students within the same school exceeded differences in average achievement between schools. This meant that the effect on achievement of attending different schools was less marked. The overwhelming majority of countries fell in between the two extremes but in general ICC values were higher than those found in industrialised countries.

The third point to highlight is that this model of school effects was better suited to some countries than to others which should hardly be surprising given that the education systems were not identical. From a statistical point of view, the absence of effects might be indicative of the distribution of the school variables, the presence of outliers or to the relationship between school variables. That the data are cross-sectional places serious constraints on the amount of variance that is captured. In a way, there is tension between including more countries in a general framework and exploring possibilities for model building. The more countries that are included in an analysis, the more likely that concessions must be made in terms of the complexity of the analysis. This is precisely the reason why examining a sub-set of countries in more detail is a necessary further step. It is the approach I undertake in the analysis in Chapters 4 and 5. It is worth repeating that the absence of school effects to explain achievement differences does not mean that certain

educational inputs should be disregarded. It does suggest that differences in average academic achievement seemed less responsive to differences in certain schooling inputs in some places (Baker and LeTendre 2005). Nonetheless, with a very comprehensive model, and comparative data on a wide range of developing countries, variation explained ranged between 20 and 80 per cent and included all categories of school effects, including school organisation measures.

The final point to state is that inconsistencies in these results are as useful as similarities because they demand a more thoughtful explanation of what was happening in a country's schools at a particular point in time. Some effects were fairly widespread and consistent in terms of their direction (academic support, school resources, teaching resources, teacher quality, and teacher attendance problems). Other findings were less consistent (percentage repeaters, average age, percentage female, class size, urbanicity, community support for pupil meals). Kohn (1987) points out that this should lead to more tentative interpretations of general trends in educational quality but it does not invalidate the results of cross-national studies altogether. In the following chapter, I will present more detailed results on the models of school effects in Kenya, Tanzania and Uganda.

Table 3.4: Multilevel Models of Grade 6 Mathematics Achievement Across SACMEQ[a]

	Bot	Ken	Les	Mal	Mau	Moz	Nam	Sey	Sou	Swa	Tan	Uga	Zam	Zan
School Composition														
Average Social Background	O	++	O	O	O	++	++++	O	++	+++	+++	+++	O	O
% Repetition	O	++	O	-	O	++	----	O	----	O	O	-	O	O
% Acad. Support	O	++	O	O	O	O	O	O	O	O	++	O	++	O
Average Age Grade 6	++	-	O	+++	O	-	+++	O	O	O	O	O	O	O
% Female	O	-	O	O	O	O	O	--	++	O	O	O	-	--
School Structure														
Class Size	O	--	O	++	++	---	O	O	O	O	-	O	O	+
Urbanicity	O	O	+++	+	O	O	++	O	+	-	-	-	O	O
Sector	----	O	O	O	O	O	O	--	+	O	□	O	O	----
Resources														
School Resources	+	O	O	O	O	O	++++	O	++++	O	O	+	O	O
Teaching Resources	O	O	O	O	O	O	+	++	O	O	O	O	O	O
Teacher Quality	O	O	O	O	□	+	++++	O	□	++	O	O	O	++
School Organisation														
Community Support for Pupil Meals	O	++	O	O	O	O	O	O	O	+	O	O	O	O
Teacher Behavioural Problems	O	O	O	O	O	O	O	O	O	O	--	O	O	--
Teacher Attendance Problems	O	--	-	O	-	O	----	O	-	O	O	O	O	O
ICC	0.22	0.35	0.30	0.15	0.25	0.21	0.55	0.09	0.63	0.25	0.25	0.63	0.20	0.34
% Between -School Variance Explained[b]	56.72	44.55	20.10	27.81	51.04	11.24	71.87	79.50	63.55	31.56	42.09	21.38	36.27	24.42

++++,----: $p < 0.001$; +++,---: $p < 0.01$; ++,--: $p < 0.05$; +,-: $p < 0.10$; O: $p > 0.5$; □ = left out of model

a. All models contain the same student control variables (socioeconomic status, gender, academic support and repetition). b. Percent reduction of between-school variance.

3.6 Summary

In this chapter I have provided details about the data and methods that I will use in the remainder of the thesis. Data from a sample of students, teachers and school principals were collected in October and November of 2000 as part of a regional study of educational quality in African primary schools. Sampling procedures were guided by international standards. The total sample size for the three countries consisted of 8,792 students in 529 schools. As well as completing a questionnaire, students took part in a reading and mathematics assessment. I will use the results of these tests to address the research questions introduced in Chapter 2. I described the strengths and limitations of these data and how this would influence the analysis. I explained that the decision to use mathematics for the cross-national investigation of school effectiveness and gender equity was motivated by interest in explaining persistent gender gaps in mathematics achievement across the region and their link to educational quality. I pointed out that the use of the literacy assessment to guide the analysis in Chapter 5 was logical because I take a closer look at social inequality in Uganda during a period in which schooling was finally within the reach of the poor. Owing to the important role that external factors play in shaping literacy, poor students with fewer learning resources outside of school are at a distinct disadvantage.

I described how the performance of East African students in mathematics was generally higher compared to the region as whole. Among the three countries, Kenyan students stood out. They had the highest average test scores and also enjoyed the best home conditions. Grade repetition, which is an important indicator of academic background, was more common in Kenyan and Uganda than it was in Tanzania. I also compared the characteristics of schools in the three countries. Generally, the pattern of school effects was similar to patterns for students. Schools in Kenya were better resourced and schools in Tanzania had the poorest resource base. Schools were concentrated outside of urban centres, especially in Uganda. Overcrowded classes were especially serious in Tanzania. Organisational features of schools varied considerably across countries. Mean differences in constructs of social and academic organisation differed significantly across education systems.

I have shown that the hierarchical nature of these data and the type of research questions posed require a multilevel modelling approach. HLM differs from traditional regression in some important ways. It addresses some of the thorny issues related to applying traditional statistical techniques to multilevel data and questions. HLM corrects

for the downward bias in standard errors that exist in traditional regression analysis when the data structures are not accurately represented. The method is also an effective way to address policy concerns built around the distribution of achievement between students in a school (such as between boys and girls or between the more affluent and the poor). Like any statistical method, there are some drawbacks to using HLM that I have described. However, I argued that it remains a better representation of reality for research of this kind, given the obvious limitations of cross-sectional data. At the end of this chapter I discussed some of issues around international studies of education and I discussed how its value can be optimised.

I will present the results of the HLM models in the chapters that follow with a view to understanding how African schools can contribute to the optimal development of students, especially for students who are at greater risk of academic failure. In Chapter 4, the school effectiveness models for the cross-national study are presented. In Chapter 5, I will focus exclusively on school effects related to the social distribution of achievement in Uganda.

CHAPTER 4:
SCHOOL EFFECTS AND STUDENT ACHIEVEMENT: A CROSS-NATIONAL PERSPECTIVE

4.1 Introduction

Data on African education systems have multiplied in recent decades making it possible to address the challenges facing education policy makers more precisely. A clear implication of these advances is that more care must be taken in choosing countries for comparative analysis so that meaningful recommendations for improving schooling can be made. In Chapter 1, I explained that a key objective of this thesis was to understand how schools could improve educational quality and reduce disparities in learning outcomes between different groups of students. I argued that studying school effectiveness in East Africa made sense because of important ties among the three neighbouring countries compared to other countries in the region. In addition, Kenya, Tanzania and Uganda represented a sample of countries where all of the following held true: (a) average mathematics achievement in primary level mathematics differed significantly across schools (b) boys consistently outperformed girls in primary level mathematics and (c) the gender gap in performance varied between schools in each country.

Chapter 2 provided a detailed review of the school effectiveness literature and the way in which school characteristics had been used to explain educational quality in the developing world. Chapter 3 outlined how multilevel statistical techniques would be applied to the SACMEQ data for the purpose of addressing specific research questions related to ways of improving school effectiveness. The intent of Chapter 4 is to present the first group of empirical results on effectiveness and equity. In the first instance it relates student background characteristics to academic achievement in three East African countries. It also identifies schools that are capable of achieving higher achievement in mathematics in Kenya, Tanzania and Uganda . Finally, the chapter investigates conditions where the gender gap favouring boys in primary school mathematics is either reduced or aggravated. I begin by revisiting the research questions and the analytical method before turning to the results. The results are framed around the categories of school effects outlined in Chapter 3.

4.2 Research Questions

Based on the general framework that can be found in Figure 2.1 of Chapter 2, I address the following specific research questions in this chapter:

Student Background and Academic Achievement

a) *What types of students in Kenya, Tanzania and Uganda are most at risk of poor academic results in mathematics?*
b) *What is the relationship between student background characteristics and academic success?*
c) *Is there a pattern to these characteristics across countries?*

School Effects and Average Mathematics Achievement in East African Primary Schools

a) *What characteristics of schools are associated with mathematics achievement across countries?*
b) *How does the relationship between school effects and average academic achievement compare across countries?*

School Effects and the Gender Gap in East African Primary Schools

a) *What is the magnitude of the gender gap in the three countries in Grade 6 mathematics?*
b) *What characteristics of students and schools are associated with the gender gap in mathematics achievement in the three countries?*

4.3 Analytic Method

In Section 3.4 of Chapter 3, I outlined the rationale for using multilevel analysis for research of this kind. Essentially, the reasons were based on the nature of the research questions and the structure of the data. Although the outcome variable was measured at the individual student level, many explanatory variables referred to the school. The analysis presented in this chapter is conducted in three stages. In the first stage I establish whether there is systematic variation in the mathematics achievement outcome, and partition variance into between-student and between-school components. By posing this question at the onset of the analysis, it is possible to determine whether a hierarchical model is in fact necessary. It is only the variance between schools that can be pursued as a function of school characteristics.

In the second step I explore relationships between the achievement scores and characteristics of students. Student-level variables that capture social and academic background are used here, with gender as the focus measure. I also investigate the role that student SES, academic support and grade repetition play in mathematics achievement, by including these measures to adjust the gender gap for them. By including these factors in the model, I create student controls. In addition, by allowing the gender gap to vary between schools I determine whether there is a unique school effect that should be pursued later. Because I am interested in achievement differences between boys and girls, the gender variable is uncentred and allowed to vary across schools. In this way, the model for school effects is designed to target the influence of school factors on quality (estimated by effect size on the intercept) and on equity (as shown through the impact on the gender gap). The remaining slopes are fixed and centred on the population mean.

The central aim of this chapter is to identify the school-level predictors that are associated with higher average mathematics achievement and that simultaneously promote gender equity (i.e. that reduce the gender gap). I carry out separate multilevel analyses of each country's data. I add groups of school variables sequentially with more fixed compositional factors preceding the inclusion of resource related and organisation variables. To improve comparison, I also control for school location, school sector and the average age of Grade 6 students in each country. Variables that deal with the organisation of schools and classes are the last to be included. Despite efforts to explore the same issue with the same analytic models in three countries that share a number of characteristics, I

soon found that the school effects driving educational quality and gender equity were often unique. Though similar in some key respects, the final models underscore the different concerns.

4.4 Variance Decomposition for Mathematics Achievement

I present the decomposition of variance for each country in Table 4.1. In Chapter 3, I explained that the intraclass correlation (ICC) is a measure of the distribution of inequality between schools. The higher the ICC, the larger the differences in achievement scores between schools. Based on established standards (Hox, 2002; S. W. Raudenbush & Bryk, 2002; Snijders & Bosker, 1999) the ICCs found here are sufficiently large to warrant the use of a multilevel model. There appears to be a notable difference between the ICCs for Kenya and Tanzania on the one hand and Uganda on the other. Such gaps, when taken together with Uganda's lower average maths test scores seem to suggest that the expansion of Uganda's primary education system two years before these data were collected might have contributed to wider gaps in maths achievement between schools. Because Uganda did not take part in the first SACMEQ survey, ICC values for the period preceding UPE are unavailable. The reliability estimates for the outcome variable are satisfactory although they are higher in Kenya and Uganda than in Tanzania. All reliabilities are above 0.8, where perfect reliability is '1'.

Table 4.1: Variance Decomposition for Mathematics Achievement in Kenya, Tanzania and Uganda

	Kenya	Tanzania	Uganda
Grade 6 Maths Achievement	563.25	522.40	506.28
Average Within-School Sample Size	17.81	15.74	16.07
Total Variance Within Schools (sigma-squared)	5253.82	5045.17	4258.99
Total Variance Between Schools (tau)	2877.53	1919.48	7262.17
Intraclass Correlation (ICC) [a]	0.35	0.25	0.63
Reliability (lambda)	0.91	0.83	0.96

a. ICC = tau/(tau + sigma-squared)

4.5 Student Background and Academic Achievement

In Table 4.2, I present the results of the within-school model. This model addresses research questions that are directed at the influence of student background on mathematics achievement. Four variables are used to capture the nature of this effect: student gender, grade repetition history (a proxy for academic preparedness), academic support outside of school (an indicator of subject matter interest) and student socioeconomic status. The adjusted scores across all countries are still above the SACMEQ mean of 500 but students in Uganda and Tanzania lag behind students in Kenya. Interestingly, the influence of student background characteristics is greatest in Tanzania. This should, however, come as no surprise given that, compared to Kenya and Uganda, Tanzania has a smaller ICC and therefore a greater concentration of variation between students within schools. The behaviour of variables across countries is predictable and consistent. The influence of academic support on achievement in Kenya and Uganda is negligible. However, owing to its theoretical importance and for ease of comparison of school effects across countries, it is retained in further analysis. Both student socioeconomic status and academic support are related to higher mathematics achievement, whereas gender (female) and grade repetition are associated with a lower mean outcome. On average, the test scores of girls are between 20 and 30 points below average test scores for boys.

Table 4.2: Level-1 HLM Models for Mathematics Achievement in Kenya, Tanzania and Uganda

	Kenya	Tanzania	Uganda
Fixed Effects			
Intercept	575.49***	533.57***	512.29***
Socioeconomic Status	17.80***	17.02***	6.48***
Female	-22.39***	-29.51***	-19.05***
Grade Repetition	-19.14***	-23.31***	-11.93***
Academic Support	-1.16	7.96***	-1.04
Random Effects			
Variance in School Mean Achievement	2379.89***	1878.97***	6880.48***
Variance in Gender Slope	738.58***	724.31***	443.51***
Rij	4791.68	4682.04	4032.45
Reliability of OLS Regression-Coefficient Estimates			
Mean Achievement	0.81	0.73	0.92
Student Gender	0.39	0.36	0.28

~ p < .10; * p < .05; ** p < .01; *** p < .001

Not only is there a male advantage in mathematics achievement, but as shown in the bottom of Table 4.3, the gender gap also varies significantly between schools in each country. It is worth considering the size of variance for both the gender gap and for average school achievement because this will provide an early indication of where the influence of the school can be assigned. It is only differences between schools that can be explained through the school effects model. Clearly, larger between-school variation will make it easier to isolate significant school effects. The gender gap is largest in Kenyan and Tanzanian schools. The situation is different for gaps in average achievement, with larger gaps for Uganda and smaller differences for Kenya and Tanzania. Therefore although it appears that issues of quality and inequality are important in all three places, questions of quality are paramount in Uganda, whereas in relative terms, gender equity concerns are a more serious issue in Kenya and Tanzania. The relationship between student gender and

achievement is illustrated graphically in Figures 4.1 to 4.6. The figures represent a random sample of schools in each country. Each line shows average achievement for boys and girls in a single school. Not surprisingly in each instance the lines slope downward because average achievement is higher for boys than for girls. It is also important to recognise that the gradient of the lines differ slightly across countries. In general, they are steeper in Kenya and Tanzania than in Uganda because as shown in the top panel of Table 4.2, achievement gaps are more prominent there. Even more essential for exploring how school characteristics are related to gender equity, within each country the steepness of the slopes differ. These slope differences are what contribute to the random effects shown in the bottom panel of Table 4.2. Understanding which school characteristics lessen the impact of gender on achievement is what will direct the equity analysis later in this chapter.

Figure 4.1: Gender Differences in Achievement in Kenyan Primary Schools

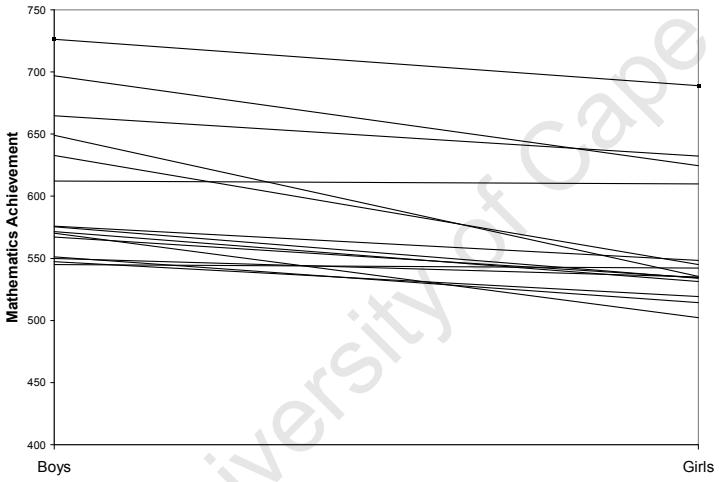


Figure 4.2: Gender Differences in Achievement in Tanzanian Primary Schools

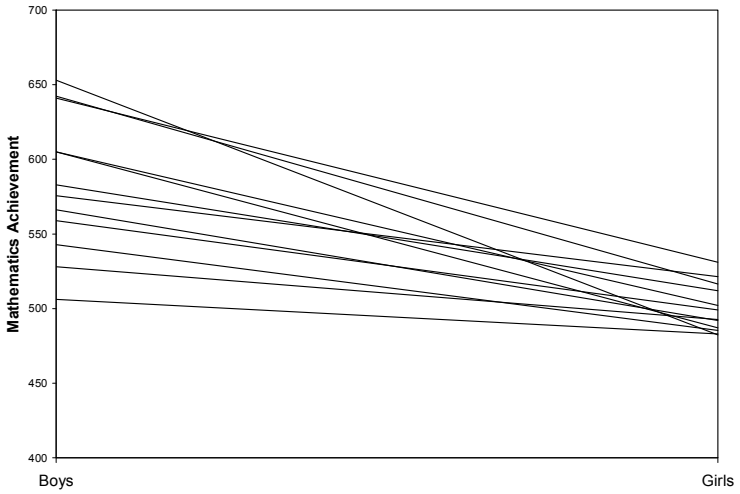
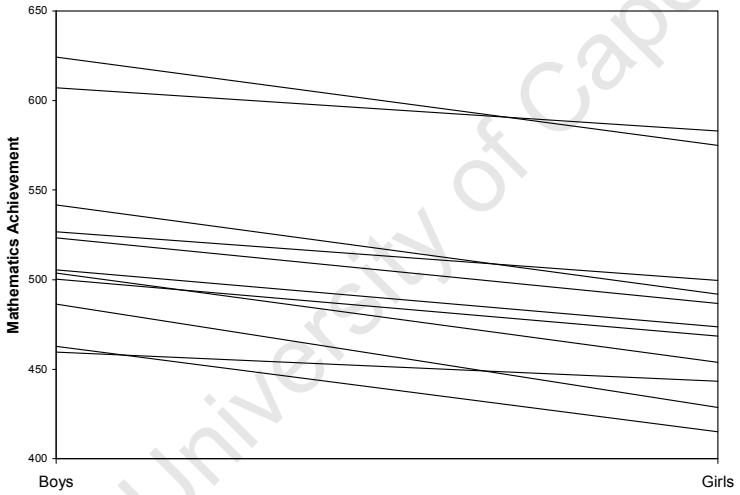


Figure 4.3: Gender Differences in Achievement in Ugandan Primary Schools



The within-school model has addressed the first series of research questions by confirming the importance of student social and academic background in influencing educational achievement. It has also shown that the pattern of effects is broadly consistent across all three countries and that the influence of student characteristics is strongest in Tanzania, which is the most impoverished of the three countries. This section has also clarified the relationship between student gender and mathematics achievement in East African schools. I have shown that because the male advantage in mathematics achievement differs in a manner that is more than random, it is reasonable to investigate how the educational environment influences this relationship.

4.6 School Effects and Average Mathematics Achievement in East African Primary Schools

Results from the previous section clearly demonstrated that student characteristics were similar across the region. Whereas socially advantaged students achieved higher test scores, female students and repeaters were at a distinct academic disadvantage. The within-school model also confirmed that some schools were more effective than others and that across countries, the differences in test scores between schools varied significantly. I endeavour to explain what was behind the success of some schools in this section as I add school characteristics to the model.

4.6.1 School Composition

The results of each country's multilevel models are shown in Table 4.3. Compared to other measures of school effects, estimates of school composition displayed the most consistent patterns across countries. There was a positive and significant relationship between higher achievement in mathematics and the social class climate across East African schools. This is unsurprising given reports of dilapidated school facilities (Rajani 2001) and heavy dependence on parental contributions. Average achievement was lower in schools with higher concentrations of poverty. The effect of average SES was strongest in Uganda where mass education had been introduced. The issue of social inequality in Uganda is an important one and it will be discussed further in the next chapter.

It is very informative that two contrasting findings on repetition in schools emerge from this study. The question of how to support academically weak students warrants special attention. Whereas Ugandan schools with fewer repeaters actually fared better, in Kenya the opposite was true[19]. The percentage of repeaters in the school was positively related to achievement at a school, which would suggest that the presence of repeaters influenced the academic climate in a way that favoured general performance. The significance of this result is that it presents a good example of the role of contextual influences in shaping a school's climate. In Kenya, it is well known that because of competitive examinations at the end of primary school, repetition tends to be aggressively encouraged both by parents and by schools (Abagi and Odipo 1997). The scarcity of places in secondary schools is common across the developing world, raising the question of why it translates to higher repetition in Kenya. The transition to secondary school is higher in

Kenya than in neighbouring countries. Whereas in some countries, primary school signals the culmination of an educational career for underprivileged children, a child of an uneducated farm labourer is far more likely to attend a secondary school in Kenya than elsewhere in East Africa (Wedgwood 2007). Repetition is also known to be related to the lack of learning resources in impoverished communities (Entwisle et al. 1997; McCoy 1998). Yet its association with achievement in Kenya and Uganda persisted even after adjusting for the influence of both student and school SES.

In Table 4.2, I showed how students who have a repetition history have significantly weaker results in mathematics in all three countries. How is it possible that at the individual student level, repeaters are on average academically weaker than non-repeaters but at the school level, higher repetition benefits average performance? The most plausible explanation is that each variable represents a different phenomenon. Achievement differences between students based on repetition represent how repeaters perform compared to non-repeaters for the population in general. When repetition is defined as a school measure, then it reflects how the concentration of repeaters impacts on the average achievement of a school. It could well be that in certain contexts, schools with a large number of repeaters tend to be more competitive because a heavy emphasis is placed on the school's reputation on national examinations. Teachers are also likely to encourage repetition if student performance is linked directly to them. Repetition may be driven less by individual academic preparedness and more by other academic goals that are operating within these environments.

It is important to point out that the repetition effects identified here were net of the effect of student age because the average age of Grade 6 students was accounted for within each country. Therefore the effects of repetition are independent of the obvious complexities of having an older cohort of students in a school. Could repetition be the cause rather than the consequence of poor achievement? After all, the direction of causality is impossible to confirm without longitudinal data. Further investigation would be required for a clearer interpretation. What is quite clear is that unlike in Kenya, there was a negative compositional effect for Ugandan schools that had a high concentration of repeaters over and above the effect of individual student repetition on achievement. In short, repetition neither helped low academic ability students improve their performance nor created a climate that promoted scholastic development in Uganda. High repetition rates are often criticised because they stretch the resources of schools, inflate class sizes and increase the likelihood of dropout (Lockheed and Verspoor 1991). I tested for interaction effects

between the percentage of repeaters in a school and related school characteristics in Kenya and Uganda but none could be captured by these data. Elsewhere, high repetition and drop-out rates in Uganda have been attributed to a lack of interest in schooling, a factor that was not available in these data (Government of Uganda 2000). Other studies have also linked repetition to lack of motivation among students (Haddad 1979) and this is certainly an area that requires further exploration in this region.

Related to student motivation is the level of interest in a student's academic development that is shown by household members. The composite measure of academic support comprised information about whether a student had someone to verify that homework was completed, enquired about what was learned at school, was available to provide assistance and provided additional practise material. It was only in Kenya and Tanzania where higher concentrations of academic support at a school benefited average achievement of a school. Parental involvement and how much they value education are factors that have been found to make a difference in educational quality in previous studies of Tanzanian primary schooling (Mosha 1988). Moreover this was beyond the effect of the average social background of students in the school, lending support to the theory that the benefits of parental involvement can function independently of socioeconomic status of students (Balli et al. 1998).

Kenyan students achieved higher test scores in general and Kenyan girls outperformed their counterparts elsewhere (see Table 4.4). Yet within Kenya, a higher concentration of girls in a grade was related to significantly lower performance in mathematics. I return to this point in Section 4.8 of this chapter when discussing the findings related to school effects and the gender gap.

Table 4.3: Final Level-2 HLM Model of Mathematics Achievement in Kenya, Tanzania and Uganda

	Kenya	Tanzania	Uganda
Intercept (Average Achievement)[a,b]	575.60***	536.24***	524.04***
Measures of School Composition			
Average Social Background	11.73*	14.03**	23.18**
Percentage Repetition	12.89**	-	-12.36*
Percentage Female	-9.17*	-	-
Percentage Academic Support	10.69**	12.23**	-
Average Age of Grade 6 Students	-12.04*	1.69	-6.50
			-
Measures of School Structure			
Class Size	-7.32*	-5.52*	-
Urban School Location	3.51	-20.65*	-38.08*
Sector	-5.45	N/A	-9.75
Measures of Resources			
Physical Resources	-	-	13.39*
Measures of School Social Organisation			
Community Support for Pupil Meals	16.50*	-	-
Teacher Behavioural Problems	-	-5.46*	-
Teacher Attendance Problems	-10.25**	-	-

~ p < .10; * p < .05; ** p < .01; *** p < .001
a. Because the within-schools models are the same as those shown in Table 4.2, they are not repeated here.
b. In this table, dashed lines represent variables that were dropped due to non-significance.

4.6.2 School Structure

Most schools in the East African samples were located outside large towns or cities[20]. In both Tanzanian and Ugandan school systems, primary schools that were situated outside urban centres performed better on the average. This could be a reflection of places with strong educational legacies due to the longstanding presence of rural missionary schools (Colclough et al. 2003). This pattern could also be related to enrolment rates. Urban enrolments exceeded rural enrolment by as much as 15 per cent in some areas (Rajani 2001) and with more students from lower socioeconomic backgrounds attending schools, average test scores were likely to be lower. There is some evidence that the urban advantage in schooling may actually be reversed if rural areas are compared with urban slum areas because living conditions are notoriously desperate in African slums (Mugisha 2006) but no distinction was made between urban slum and non-slum areas in these data. The coefficients for government school sector had the expected negative sign but there

were no notable effects related to school sector and mathematics achievement in any country. In Tanzania, all schools in the sample were government-owned therefore no adjustment for school sector was necessary. I left the sector and school location variables in the model as controls so that final estimates accounted for these important differences in school structure.

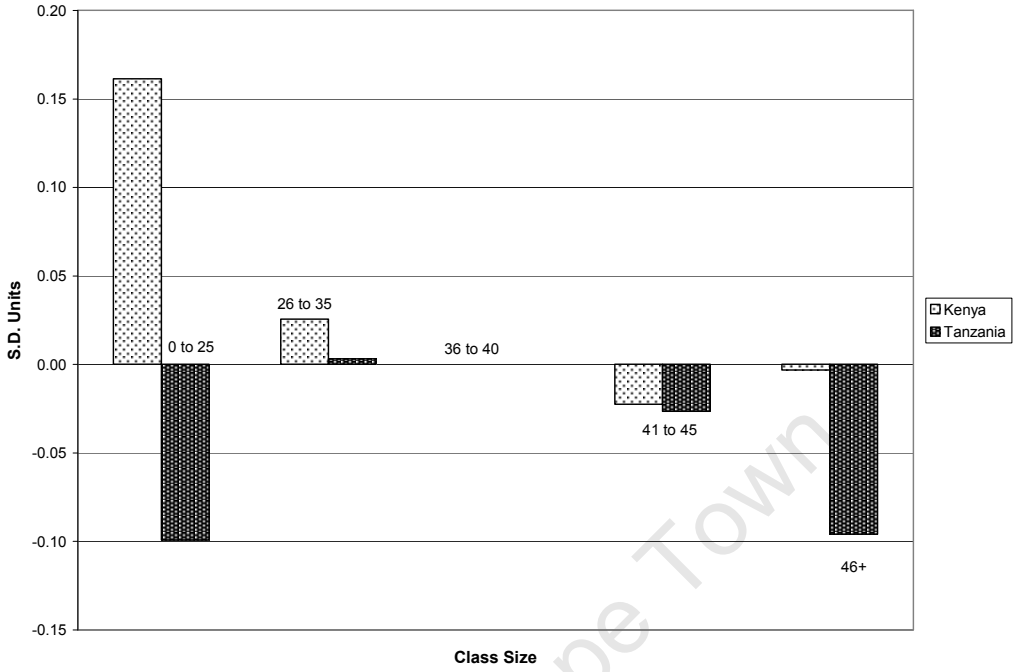
With mounting pressure on education systems to expand enrolment, class size is a factor that is quickly compromised. Arguments around class size are motivated by organisational and efficiency considerations. Concerns about the costs related to reducing class size stand in contrast with views that champion the benefits of teaching smaller groups of students (Galton 1998; Korostoff 1998). Class size stood out among the measures of school structure that were related to academic achievement in Kenya and Tanzania[21]. Smaller classes were beneficial to all students, regardless of gender, academic background or social status. Because the pattern of class size on achievement was so similar in the two countries, it provided an ideal opportunity to conduct a more textured analysis of whether there was an optimal class size that applied to both countries.

Which Class Size?

Figure 4.4 shows the results of modelling different categories of class size on average mathematics achievement. I created five ranges of class size and selected the middle range of 36 to 40 students per Grade 6 class as the reference category. The choice of reference category was based on reported average class sizes for developing countries which also applied to Kenya and Tanzania (Lockheed and Hanushek 1988; Mjagila 1999; Onsomu et al. 2005). The questions that I was interested in here were: Is there an ideal class size that can be generalised across countries? How does student achievement differ for different class sizes? Does class size have a differential effect on achievement for different groups of students? There was a marked difference in patterns of class size and achievement across countries. In Kenya, after adjusting for other school factors, there was a slight advantage in class size arrangements of up to 25 students. In contrast, in Tanzania, there appeared to be diminishing returns to increasing or reducing class size drastically. Optimal class sizes fell within the range of 26 to 35 students per class. Although patterns of class size differed across the two countries, it was also clear that given the organisation of learning there, optimal sizes were not as low as recommended in high-income countries (Glass and Smith 1978; Word et al. 1990). This implies that it would be inappropriate to apply class size targets from one developmental setting to another. It is worth mentioning that like many

well-known studies of class size, the effects in Kenya and Tanzania persisted even after including other measures that are known to be directly related to class size, such as the quality of instruction and the availability of teaching resources (Word et al. 1990). The effect sizes in Figure 4.4 were estimated after controlling for these factors and the extended models is found in Appendix 4.1 at the end of the thesis. Because of the obvious cost implications of reducing class sizes, a comment on how meaningful these results are in real terms is necessary. In Figure 4.4 it is clear that the most notable improvement in class size emerged in Kenya for class sizes within the range of 0 to 25 where test scores are 40 points higher on average (see Appendix 4.1). A closer inspection of the figures revealed that reducing class size to within this range from the reference category of 36 to 40 students would yield a modest gain of less than 7 per cent in achievement scores. This sobering view is not aimed at discounting the value of smaller classes but I include it to emphasise the importance of inspecting the results as thoroughly as possible before touting the benefits of any policy directive.

Figure 4.4: Effects of Class Size on Mathematics Achievement in Kenya and Tanzania[a]



a. For ease of presentation in a single graph, I present the results in standard deviation units calculated as: γ [S.D(X)/S.D (Y)], where γ is the value of the adjusted class size coefficient, S.D.(X) is the standard deviation of the class size variables and S.D. (Y) is the standard deviation of the outcome variable (Hox 2002; Snijders and Bosker 1999)

As previously stated, it is sometimes suggested that schools with higher levels of grade repetition will experience overcrowding in classrooms and that ultimately this will lead to lower achievement (Lockheed and Verspoor 1991). I tested for interactions between class size and the percentage of repeaters in a school as well as between class size and the school's average social background but these interactions proved to be insignificant. Nor was there evidence from these data that class size was systematically related to the teacher attendance problems that were identified in Kenya. Some researchers have suggested that the relationship between class size and achievement is confounded by streaming practices in schools that deliberately place students in different classes based on their ability levels (Akerkielm 1995; Darmawan and Keeves 2006). This cannot be the explanation for these results because students were randomly sampled across classes within a grade and the class size variable represented the average across Grade 6 classes in a school.

4.6.3 Resource Effects

Of the three countries considered here, it was only in Uganda that the relationship between mathematics achievement and school resources stood out. The composite measure of school physical resources consisted of information on the availability of a wide range of school facilities including a library, hall, staff room, office for the school head, store room, sports ground, garden, fence and cafeteria. Resource rich schools generally performed better in Uganda. I will take a closer look at resource effects in Uganda in Chapter 5. As mentioned in Chapter 3, I also tested for relationships between human resource measures and student achievement but found no evidence of significant effects in any country. It is somewhat surprising that the findings related to resource effects were so limited across the region given a fairly consistent series of studies that have emphasised their importance to African education systems (Fuller 1987; Heyneman and Loxley 1983; Lockheed et al. 1986). It is most surprising that no resource effects were detected for Tanzania because it is well known that school facilities there had reached a point of collapse by the late 1990s and that government struggled to find adequately qualified candidates to enrol in teacher training colleges (Rajani 2001). These results don't necessarily cast doubt on this dimension of school effects but they do suggest that variation in average values of these measures may not always be linked to variation in the student achievement measure.

4.6.4 School Organisation

There was modest evidence that measures of school organisation influenced achievement but this was only in Kenya and Tanzania. In Kenya, there was a positive and significant relationship between higher achievement in mathematics and active community involvement. Community involvement has been identified as an important organisational feature in developing countries because communities are able to identify the needs of the school more quickly and school administrators are forced to be more accountable if they are members of the community (Jimenez and Paqueo 1996). Regular teacher attendance was found to be important in Kenyan primary schools. Students are more likely to excel when they have regular sessions of instructions and progress through the curriculum at a steady pace (Fuller et al. 1994). When teachers are absent, either classes are combined or a

replacement teacher is found. In the most extreme case, students miss out on lessons altogether.

Related to teacher attendance is the importance of an ordered environment because both ensure that students receive an uninterrupted periods of instruction. In Tanzania, the climate of discipline was related to academic performance. Schools with low levels of teacher behavioural problems achieved significantly better mathematics results. A good example of the indifferent attitudes of some Tanzanian teachers has been documented. Teachers are known to assign a student to copy the day's lesson on the board for other students to duplicate instead of actively participating in teaching (Rajani 2001). The measure of teacher behavioural problems also included information on sexual harassment and bullying. According to Rajani (2001), these forms of harassment are quite serious in some Tanzanian schools and students can be threatened with bad marks if they do not comply with the teacher's demands. The abuse of corporal punishment has also received wide attention in Tanzania. Teachers are known to strike students publicly for such minor offences as answering a question incorrectly or failing to pay tuition fees on time.

So far, I have discussed the school characteristics that relate to general student performance and noted which of these appear in more than one educational context. In the next section I turn to an example of how the education domain can influence achievement differences between different groups of students and whether the results can be generalised across countries.

4.8 Why Consider School Effects and the Gender Gap?

Trying to understand which environments benefit educational quality in general is the more common way to conduct school effects studies. There is another way to look at the school's role in student development and that is to consider whether schools can be effective in reducing differences in achievement between groups of students. Persistent gender gaps in mathematics and science subjects are well documented and I provided a rich review of pertinent literature in Chapter 2. Although research has consistently demonstrated that educating girls has a positive effect on various aspects of development (Caldwell 1986; Curtis et al. 1993; Hobcraft et al. 1985; Kishor 2000; Kizito 1998), progress in girl's education has often been marred by misplaced notions about the value educating girls. Educational opportunities for girls were not always forthcoming in East Africa. Opposition has come in many forms and has cut across tribe and class (Kanogo 2005). At issue are fears that formal schooling for girls would interfere with traditional norms and practices. For many girls in Africa who have chosen to pursue their educational ambitions, it has continued to be a lonely pursuit. Mathematics and science disciplines are traditionally dominated by men. Even in the most progressive societies some maintain that girls are mathematically inferior to boys, with more pronounced differences expected during adolescence. Girls who choose careers in these fields may find themselves facing acute challenges, even open hostility. In this section I consider how the educational domain can influence the magnitude of gender differences within the school.

Descriptive Evidence on Gender Differences in East African Countries

Because this section is concerned with gender-based differences in achievement, in Table 4.4 I present further descriptive details on the characteristics of boys and girls in the three study areas. Student performance based on country and gender showed that the average mathematics score for Kenyan girls was substantially higher than for the entire samples of Tanzanian and Ugandan students. On average, Kenyan girls achieved better results in mathematics than Tanzanian and Ugandan students irrespective of gender. In fact, there is a considerable gap between the general performance of Kenyan students and Tanzanian boys on the one hand and Ugandan students and Tanzanian girls on the other. As stated earlier, the magnitude of gender differences in mathematics achievement is quite variable, with a very small gender gap for Uganda for the sample as a whole, and a much wider gap in Tanzania, where the gap in mathematics achievement was in excess of 30

points. Research has suggested that grade repetition is more frequent for boys (McCoy 1998). However this is not reflected in these countries.

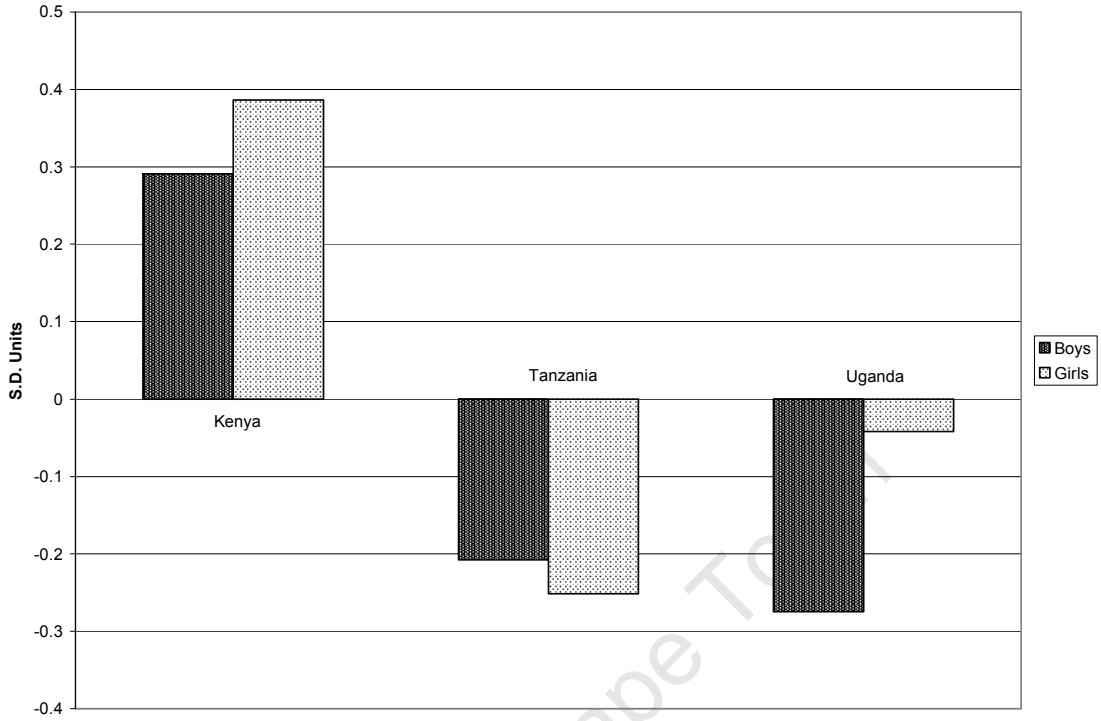
Table 4.4: Some Measures Related to Gender Differences in Mathematics Achievement

	Kenya			Tanzania			Uganda		
	M	**F**	**Total[b]**	**M**	**F**	**Total[b]**	**M**	**F**	**Total[b]**
Sample Proportion[a]	1692	1604	3296	1376	1473	2849	1471	1148	2619
Mathematics Achievement	574	552	563	540	507	522	508	504	506
SES[c]	0.29	0.39	0.34	-0.21	-0.25	-0.23	-0.27	-0.04	-0.17
Proportion Grade Repetition	0.65	0.63	0.64	0.23	0.23	0.23	0.52	0.54	0.53
Proportion Academic Support[c]	-0.06	0.08	0.00	0.17	0.14	0.16	-0.24	-0.10	-0.18

a. Unweighted sample size. This is the sample that took part in the mathematics test.
b. Estimates for male and female students combined.
c. In this table, the SES and academic support variables are in a standardised (z-score) metric, mean (M)=0, standard deviation (SD)=1 across countries. For the multilevel analysis, they are standardised within each country.

Figure 4.2 shows the relationship between gender and SES across countries. The most striking result of this figure is that SES is much higher for girls in Uganda. Uganda was one of the first African countries to respond to the global push for high quality UPE. It has been suggested that re-enrolments at higher grades of primary school were greater for boys than girls in Uganda after UPE was introduced in 1997, which would mean that more boys from low-income groups returned to higher grades of primary school (Appleton 2001). These data seem to provide evidence to support Appleton's claims. In Tanzania, girls and boys were of very similar socioeconomic backgrounds, although the SES of both girls and boys was below the average for the three countries. The same pattern emerged for the proportion of academic support provided outside of school.

Figure 4.5: Student Socioeconomic Status and Gender Across East Africa



The descriptive analysis shown here is an early indicator of the educational realities confronted by girls in East Africa. Kenyan girls were clearly better off academically and socially than their female peers in the other two countries. However, they also repeated a grade more often. Average test scores for Tanzanian and Ugandan girls were virtually identical. Although Tanzanian girls were the most socially disadvantaged, the level of interest shown by members of their household was greater than what Kenyan or Ugandan girls received. This pattern may reflect societal views about adult responsibilities in student education that may operate independently of the student socioeconomic circumstances (Chen and Stevenson 1989). The opposite trend was true for Ugandan girls who, although wealthier than Tanzanian girls on average, compared unfavourably in terms of outside support for their academic work.

4.9 Results for School Effects and the Gender Gap

The results of the gender analysis are presented in the bottom panel of Table 4.5 as well as graphically in Figures 4.6 to 4.9. For clarity I repeat the results of the intercepts model shown in Table 4.3 so that school effects related to quality and equity can be discussed jointly. Because the variable for gender was coded '1' for female and '0' for male and its coefficients were negative across all countries, narrowing the gender gap that favoured boys would require positive coefficients for school factors that were modelled on the gender slope. Conversely, when school variables that were modelled on the gender slope yielded negative coefficients, this meant that they were associated with a wider gender gap. In spite of the clear similarities that unite these countries, a common thread that tied specific school effects to the gender gap did not emerge. What did become apparent was that school characteristics that were related to higher academic quality invariably benefited boys more than girls and therefore had the effect of widening rather than narrowing the gender gap.

Table 4.5: Final Level-2 HLM Model of Mathematics Achievement in Kenya, Tanzania and Uganda

	Kenya	Tanzania	Uganda
Intercept (Average Achievement)[a,b]	575.60***	536.24***	524.04***
Measures of School Composition			
Average Social Background	11.73*	14.03**	23.18**
Percentage Repetition	12.89**	-	-12.36*
Percentage Female	-9.17*	-	-
Percentage Academic Support	10.69**	12.23**	-
Average Age of Grade 6 Students	-12.04*	1.69	-6.50
			-
Measures of School Structure			
Class Size	-7.32*	-5.52*	-
Urban School Location	3.51	-20.65*	-38.08*
Sector	-5.45	N/A	-9.75
Measures of Resources			
Physical Resources	-	-	13.39*
Measures of School Social Organisation			
Community Support for Pupil Meals	16.50*	-	-
Teacher Behavioural Problems	-	-5.46*	-
Teacher Attendance Problems	-10.25**	-	-
Gender Achievement Gap (a)	-23.17***	-33.07***	-18.94***
Measures of School Composition			
Percentage Female	11.55**	-	-
Average Social Background	-	-	-
Percentage Academic Support	-	-9.02**	-
	-	-	-
Measures of Resources		-	-
Physical Resources	-	-	-6.20~
	-	-	-
Measures of School Structure	-	-	-
Urban School Location	-	28.07****	-
Random Effects	**Variance Components**		
Variance in School Mean Achievement	1852.73***	1678.63***	5678.24***
Variance in the Gender Slope	648.02***	626.71***	417.36**
Level-1 error	4800.18	4675.03	4031.11

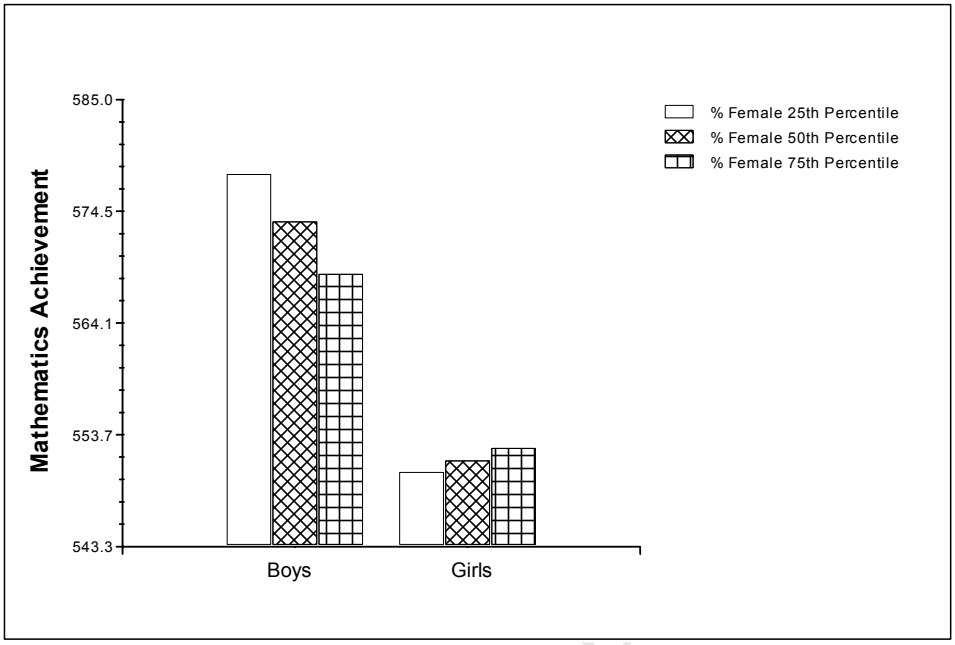
~ p < .10; * p < .05; ** p < .01; *** p < .001

a. Because the within-schools models are the same as those shown in Table 4.2, they are not repeated here.

b. In this table, dashed lines represent variables that were dropped due to non-significance.

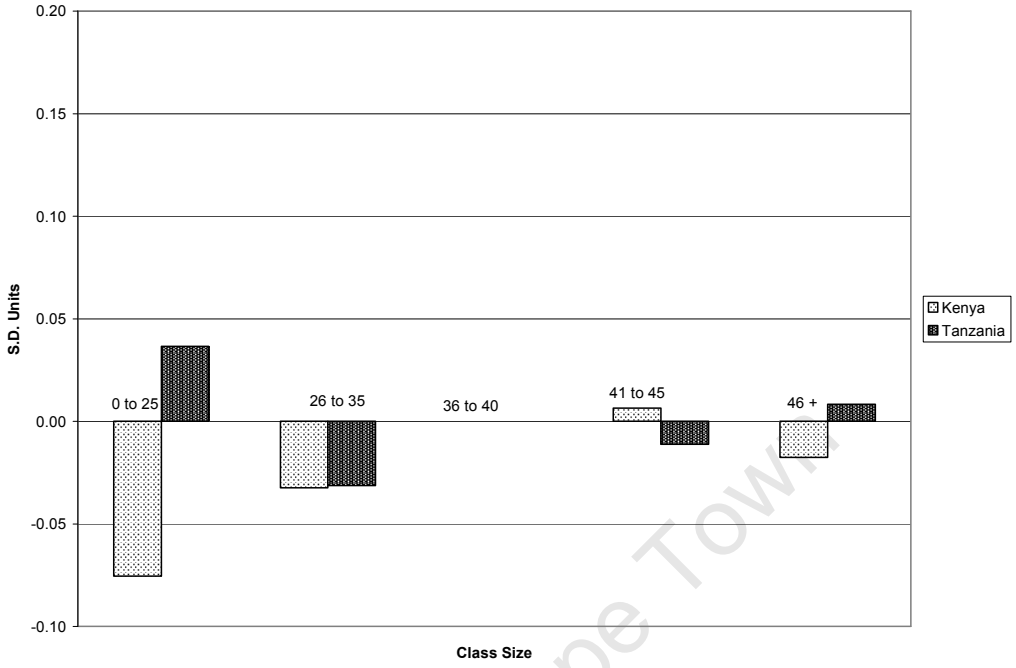
In Kenya this was seen in the gender composition of students. After adjusting for the effects of intake characteristics (socioeconomic status, gender, academic support and academic support outside of school), schools with a higher percentage of boys achieved significantly better results in mathematics. Every 1 SD increase in the percentage of female students yielded a 9 point drop in the mathematics test score. Although schools with a higher concentration of boys performed better, the gender gap favouring males was also significantly wider in these education environments. It would appear that in schools with more female students, quality was low but equity was high, implying that students performed equally poorly. Conversely, in schools where boys dominated, quality was high but at the cost of gender equity. Figure 4.6 depicts this effect more clearly. Irrespective of the gender composition of schools, boys outperformed girls in mathematics in Kenyan primary schools by a wide margin but the gap was most acute where the percentage of girls in school was lowest. The definition of an effective school pursued throughout this thesis is one where there is higher academic achievement, net of students' background characteristics and a more equitable distribution of achievement. Based on this definition, school effectiveness would require that girls attending certain types of schools would benefit but with no compensatory loss to boys. This is certainly not the result achieved here. The fall in average test scores as the percentage of females increased was due mainly to deterioration in the average test scores of boys. There was no notable change in the average test scores among girls irrespective of the gender composition of schools.

Figure 4.6: Effects of Gender Composition on the Gender Gap in Mathematics Achievement in Kenya



Earlier in this chapter, I demonstrated how scholastic achievement in classes that were smaller than the average was significantly higher in Kenya. There was also some evidence to support claims that class size differentially affected achievement of different types of students. On average, the benefits for mathematics achievement of receiving instruction in smaller class units were greater for Kenyan boys than for Kenyan girls. This supports previous claims that boys benefit more from this instructional arrangement (Nye et al. 2004). As in earlier studies, the strength of findings on the differential effects of class size here were less robust than results related to the impact of class size on average achievement (see Appendix 4.1). Figure 4.7 illustrates the relationship between class size and the gender gap in the two countries where class size was important[22]. As explained earlier, an increase in the gender gap would be represented by a negative effect size. Most of the effects are negligible but the most striking finding is that Kenyan boys benefited slightly more than girls from small class size arrangements. For class sizes of upto 25 students, the existing gap in test scores between boys and girls increased by nearly 20 points.

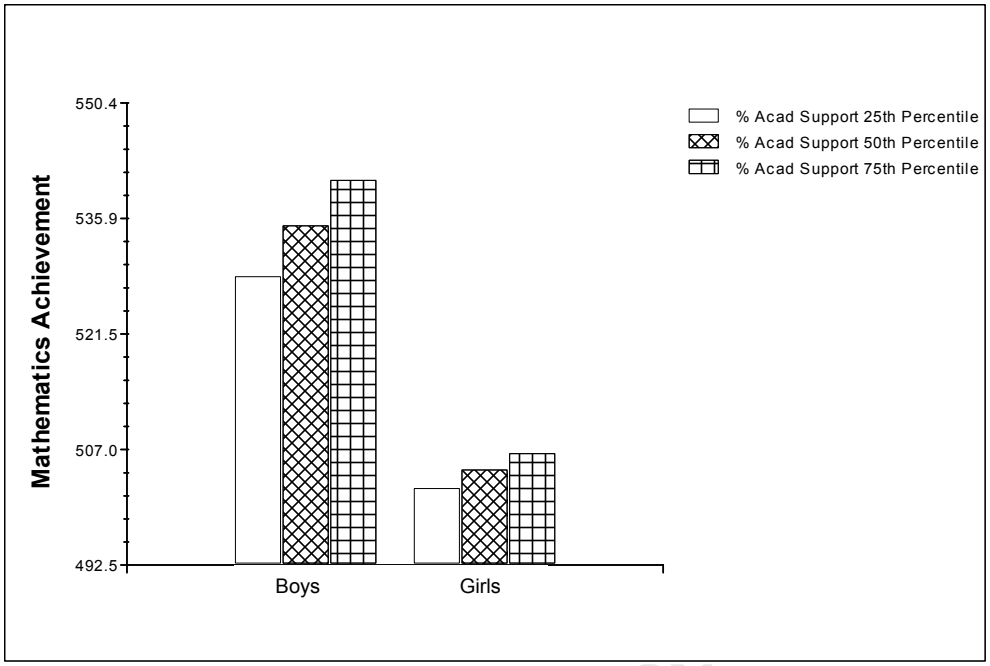
Figure 4.7: Effects of Class Size on the Gender Gap in Mathematics Achievement in Kenya and Tanzania[a]



a. For ease of comparison, I present the results of this graph in standard deviation units calculated as: γ [S.D(X)/S.D (Y)], where γ is the value of the adjusted class size coefficient, S.D.(X) is the standard deviation of the class size variables and S.D. (Y) is the standard deviation of the outcome variable (Hox 2002; Snijders and Bosker 1999).

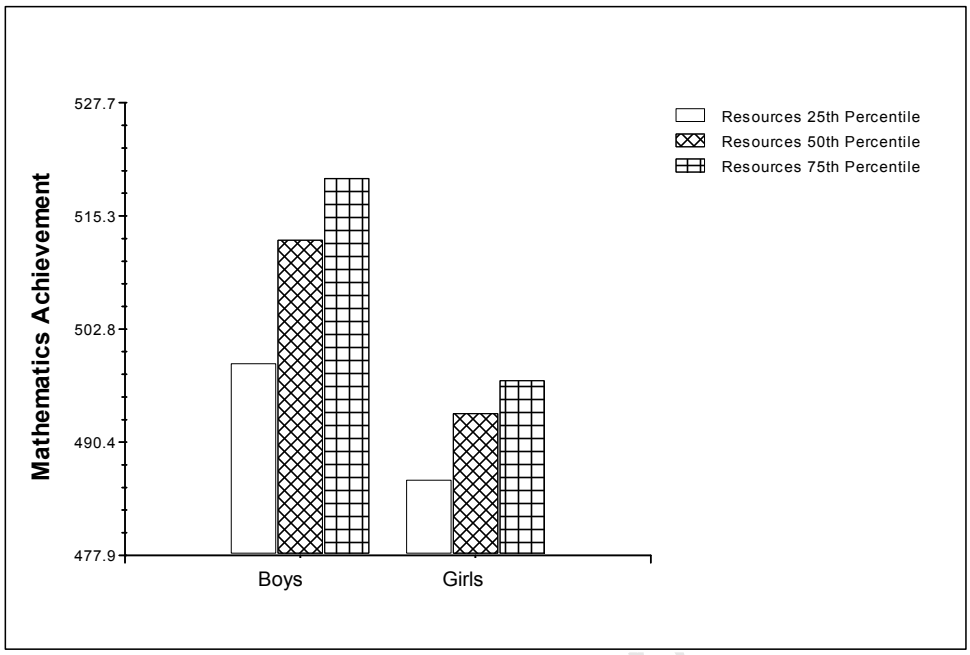
A similar dichotomy of school effects appeared in Tanzania. Schools situated outside of urban centres in Tanzania were simultaneously found to have higher test scores on average but wider gender gaps in achievement (see Table 4.3 above). Therefore schools in urban centres, although more equitable, were academically weaker. Tanzanian primary schools where external interest in a student's work was prevalent achieved higher test scores but the greatest gains once again were experienced by male students (see Figure 4.8 below).

Figure 4.8: Academic Support and the Gender Gap in Mathematics Achievement in Tanzania



The pattern persisted for resource effects in Uganda and is shown in Figure 4.9. Whereas a greater availability of resources was linked to higher educational quality, the gender gap was also more apparent in resource rich schools. Moreover this gap widened the most when comparing schools with low resources and schools with average resources (i.e. between the 25th and 50th percentiles) implying that it was in deprived areas that boys made the greatest gains from resources compared to girls.

Figure 4.9: School Resources and the Gender Gap in Mathematics Achievement in Uganda



The variance explained by the final model can also be calculated by using Tables 4.2 and 4.3. The variance explained by the final model differed from country to country. Generally, the model was more successful in explaining variance in achievement (22 per cent in Kenya, 11 per cent in Tanzania and 18 per cent in Uganda) than in explaining the gender gap (12 per cent in Kenya, 13 per cent in Tanzania and only 6 per cent in Uganda).

4.11 Summary

The central purpose of this chapter was to identify school factors that both raised academic levels of performance and that narrowed the gender gap in mathematics achievement between girls and boys in East African countries. The decision behind the selection of countries was twofold. First, they represented a group of countries with some natural linkages, meaning that it would make sense to draw policy lessons about where one country was making advances. Second, all three had significant gaps in achievement between schools and between boys and girls within schools. I began by comparing the sample of students before making school effects comparisons and drawing together the broader policy implications of these results. Student background characteristics were

broadly similar although the link between student characteristics and achievement was stronger in Kenya and Tanzania, where variation among students was greater.

Across countries, there was a positive and significant relationship between higher achievement in mathematics and the social class climate of the school. This was the only measure to be systematically related to average achievement in all three countries. That schools with a wealthier student body would achieve significantly better results is not unique to developing countries (Blossfeld and Shavit 1993). Although noteworthy, there is a limit to the policy interventions that can be extracted from such a finding. In general there was more room for comparison of school effects between Kenya and Tanzania. In both countries measures of school composition, school structure and school organisation were shown to be related to student achievement. Schools with students who received greater academic support performed better as did schools with smaller Grade 6 classes. Where schools had more committed staff members achievement tended to be higher. This was captured by a variable for teacher attendance in Kenya and teacher discipline in Tanzania. Evidence from Ugandan schools appeared to be less comparable, a likely reflection of dramatic changes to the education system prior to the collection of these data that had not yet taken place in the other two countries.

School effects related to gender were few and unrelated across settings. This is due in part at least to the importance of local conditions. However, given a more detailed survey of student attitudes towards their subject matter, there would quite possibly be more results to compare. One important finding related to gender is that across countries, factors that were related to improved academic achievement tended to widen rather than narrow gender-based achievement differences. The implication is that the climate for learning in East African primary schools is still better suited to educating boys than girls. Baker and LeTendre (2005) have attributed the elimination of gender gaps in learning in American public schools to a focus on individual student potential irrespective of a child's gender. In developing countries, where beliefs about social and intellectual differences are instilled from birth, it is hardly surprising that gender roles would be reinforced and even amplified in the context of schooling. The lesson here is that the climate of schooling remains be deeply rooted to its exterior context.

Throughout this chapter, I have alluded to some of the changes experienced by Ugandan schools when school fees were abolished. Mass education led to an unprecedented increase in enrolment of students from poor households and exerted tremendous pressure on the resource levels of schools. I have already demonstrated in this

chapter that resources were the foremost school characteristic related both to achievement in mathematics and to gender differences in achievement in Uganda. In Chapter 5, I consider the relationship between resource effects, social inequality and primary school reading achievement. How various resource measures mediate this relationship in the context of free education is the focus of the final school effects investigation of this thesis.

CHAPTER 5:
UPE AND SOCIAL INEQUALITY IN UGANDA:
A STEP BACKWARD OR A STEP IN THE RIGHT DIRECTION?

5.1 Introduction

In the previous chapter, I discussed school effects that were related both to average academic achievement and to gender-based achievement differences in mathematics across three countries in East Africa. A noteworthy finding that was distilled from that discussion was that there was a strong relationship between resource availability and mathematics achievement in Uganda. Resource availability was also related to gender differences and tended to benefit boys more than girls at the primary level. In this chapter I explore this relationship more closely to question whether the resource environment of a school has a different effect on achievement depending on the socioeconomic background of students at the school. This issue is considered in the context of public reforms that were designed to increase educational opportunities in poor communities. I explore the costs and benefits of mass education in Uganda from both a private and social resource perspective. Resource availability is a popular policy target because it avails easy scrutiny. For this reason, variation in resource availability is usually a focal point whenever school reforms are introduced. The rationale for using literacy knowledge to explore this particular issue in Uganda is worth repeating. Contrasts in literacy practices outside of the school are known to place low-income students at a marked disadvantage from a very early age (Heyneman 2003; van Steensel 2006). There is mounting evidence that children from impoverished homes have limited access to written material, have little exposure to regular reading habits in the home and are therefore at higher risk of academic failure in reading (Smith and Dixon 1995; Willms 2004). Families with high socioeconomic status can invest more in developing their children's literacy knowledge, meaning that these students enter and progress through school with more advanced literacy skills (Snow et. al 1991).

In Chapter 2, I discussed the longstanding debate around the importance of resources as an influence on education. The emerging consensus is that the strength of association is greater in developing countries where even basic facilities are scarce and where variation in the supply of education resources between schools is known to exist (Fuller 1987; Heyneman et al. 1981; Heyneman and Loxley 1983; Lee et al. 2005; Lockheed 1993; Lockheed and Hanushek 1988). In the same way, because children from poorer homes

have limited access to educational resources outside of school, it is more likely that resource benefits will be greater among poorer students within a school.

The literature has also suggested that although the magnitude of resource effects on academic achievement is greatest in areas of scarcity, the marginal gain of expanding resource availability may depend on how resources are classified (Raudenbush and Bhumirat 1992). The intent of this chapter is to understand both direct and indirect resource effects because this carries with it important implications for policy decisions about where to focus resource distribution. What qualifies as an important resource input depends heavily on the context of a school, the structure of the education system and whether resources are identified as a school or a student characteristic. Although the role of socioeconomic status on educational inequality had been widely reported in high-income countries (Blossfeld and Shavit 1993; Burstein et al. 1980; Hauser 1970), researchers often downplay its importance in widening gaps in academic achievement within developing countries (Heyneman 1976a; Heyneman 1976b). Moreover, whereas previous studies have provided very narrow definitions of educational resources, I use a research model that is more comprehensive. Each type of resource reaches the school through different mechanisms. My approach underscores the importance of clearly identifying the pathways through which resources affect educational quality, especially in a developing setting where scarcity is the norm rather than the exception.

This chapter is not an assessment of whether learning outcomes deteriorated after UPE was introduced in Uganda (although evidence strongly suggests that they did). How resource distribution related to scholastic development in the context of a mass education system remains the central consideration. The guarantee of a quality public education is not an easy undertaking. As Lockheed and Verspoor (1991, p.271) explain, the goal is to "…design a system of allocating central government resources that would favour disadvantaged communities and would complement locally generated resources." I begin by discussing the condition of primary schooling in Uganda and the social mix of students attending state schools at the time data for this study were collected. I also review related literature on resource effects and educational quality in Uganda and the empirical evidence in the period leading up to educational reforms. The results of data analysis are divided into two sections. The first presents the descriptive evidence on students and schools in Uganda and the second reveals the results of the multilevel analysis.

5.2 UPE in Uganda: The Condition of Uganda's Primary Schools

In 1986, a new political regime known as the National Resistance Movement came to power in Uganda. This signalled the end of decades of internal turmoil. The discussion in Chapter 1 noted that under the leadership of Milton Obote and Amin in the 1970s and 1980s, Uganda's education infrastructure was virtually destroyed, and in some parts of the country students and teachers were forcibly drawn into the conflict (Mushemeza 2003). To a large extent, it was community support that prevented the education system from completely collapsing. During this period parental contributions were essential. Parents covered as much as three-quarters of school expenses (Appleton 2001; Heyneman 1983; Nishimura et al. 2007). Uganda's fee-free education system was announced in 1996 and launched in 1997. This triggered massive increases in enrolments[23]. Primary school enrolments doubled in the first year and continued to increase until 2003 (Alubisia 2005). Not surprisingly, differences in enrolment levels between students from low-income and high-income groups reduced by nearly two-thirds (Deininger 2003). Because there were no age caps on attendance, older children also contributed to the burgeoning numbers of primary level students. Uganda's 'big bang' style of UPE effectively created a complex combination of students with varying educational needs.

Although government abolished school fees, certain private costs remained in place. For example, parents were still expected to provide school uniforms, lunches, stationery and labour for the construction of school facilities (Mushemeza 2003; Nishimura et al. 2007). Rules regarding uniforms in state schools were relaxed but were often enforced internally (Colclough et al. 2003). School principals that insisted on standard uniforms argued that they made wealth differences among students less apparent. According to Alubisia (2005), for students who were unable to purchase uniforms, missing classes or dropping out of school were often preferred options.

Government responsibility for primary schools now included paying teacher salaries, purchasing teaching materials and the covering the costs of school buildings (Penny et al. 2007). Because the direct costs of schools differed substantially, state funds were channelled to schools based on their specific needs. All government schools were allocated a capitation grant (often referred to as UPE grant). The size of the grant was determined by a school's enrolment. These grants were intended to cover student tuition costs as well as the operational costs of the school. Strict guidelines governed how capitation grants were to be used. An estimated 50 per cent was to be spent on instructional materials, a

further 35 per cent on co-curricular activities, 15 per cent on school maintenance and 5 per cent on administrative costs (Mushemeza 2003).

The second type of funding was the Schools Facilities Grant (SFG). This grant was managed by district education offices and was designed especially for the benefit of very poor schools to help them build and furnish classrooms and sanitation facilities (Penny et al. 2007). School Management Committees (SMCs) were responsible for applying for these grants and for supervising construction. Using local contractors proved to be an efficient approach to maintaining school facilities and the fact that the amount received by any school was made known publicly tended to improve accountability in some areas (Reinikka 2001).

Predictably, public reforms had their unintended consequences. Many schools ignored government directives and simply continued to collect parental contributions (Reinikka 2001). This is hardly surprising given the culture of parental involvement that had preceded these reforms. Pressure on poor parents to make private contributions also came from teachers because extra payments were used to supplement their salaries (Suzuki 2002). According to a number of studies, it was not uncommon for salary disbursements to be delayed by several months (Alubisia 2005; Dauda 2004; Penny et al. 2007). This could only have increased the school's reliance on parental contributions. Administrative leakages also meant that enrolment data grossly underestimated actual student attendance and funding failed to keep up with rising costs. As a result, schools received less than they required for their daily operations. Suzuki (2002, p.250) points out:

> Despite the government ban on mandatory monetary contribution under the UPE policy, many schools collect money from the parents through the PTA. It is plausible that parental contribution to school finance is part of the school culture in Uganda because of its long practice before the introduction of UPE.

These conditions notwithstanding, it is fairly apparent that some important steps had been taken to increase resource distribution and to improve accountability structures. Within the first seven year cycle of UPE, nearly 30,000 classrooms had been built across the country through SFG disbursements (Penny et al. 2007). What these policies failed to counterbalance were the enormous differences in private contributions to schooling that reflected extensive wealth gaps in society. On the one hand, education was more accessible than ever because tuition fees were waived. On the other, private costs remained and were

highly visible in schools. For households who were accustomed to making allowances for schooling costs, the fee waiver represented a monetary gain. For poor households with children attending school for the first time, partially free education meant making critical decisions about how to stretch their limited resources to meet these new financial commitments. It was almost inevitable that even though educational opportunities were thought to have increased, the disadvantages faced by children from impoverished homes would be emphasised when they attended school with wealthier peers. In the next section I give an account of just how stratified the education resource base was for students of different socioeconomic backgrounds before turning to its application to this study.

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5.3 What was the social mix of students in Ugandan primary schools?

That disparities would exist in private resource availability for schooling should be obvious. Yet the differences in monetary contributions made by different households for students attending government primary schools in Uganda are quite startling. In Table 5.1, I present data on the percentage of households making contributions to different primary schooling activities. Estimates are drawn from a household survey that was conducted at the same time as the SACMEQ survey (for further details about the Uganda DHS Ed Data Survey see (Uganda Bureau of Statistics 2001)). They provide a useful glimpse at the gaps in a household's capacity to support academic development. The values in Table 5.1 reflect frequencies within each wealth quintile[24]. Therefore 10 per cent of all households in the lowest quintile contributed to food compared to 44 per cent of all households in the top quintile.

Several important issues arise from this table. First, all households, ranging from the poorest to the most affluent were responsible for some direct and indirect costs of schooling. It has been reported that students of lower socioeconomic status in Uganda spent more time working and doing chores while at home than their more affluent peers (Colclough et al. 2003). Therefore the economic burden was substantially higher for families sending children to school for the first time, particularly when the indirect private costs of losing an extra labourer and an additional income source are considered. Second, certain private contributions to schooling led to improvements that would accrue to all students irrespective of the source of funds. For example, PTA payments and building development funds would be used to supplement teacher salaries and maintain buildings, thus benefiting all students. Third, although tuition expenses were supposedly covered by UPE, it is quite clear that households continued to make these forms of payment. Finally,

students from wealthier households were especially advantaged in having the means to pay for items that would yield private benefits for their education (such as extra tuition, transport and food). There is some evidence that parents went as far as insisting that school administrators introduce charges for certain extra-curricular activities (Alubisia 2005). Schools were not obligated to arrange for feeding programmes. This added to the stratified climate created at schools.

Absenteeism was common among Ugandan children especially in remote areas where they were required to walk long distances to school (Alubisia 2005). Better off students also spent more on transportation resources, which increased their selection of schools significantly. Long distances to school also increased the cost of schooling in poor families because children would be away from home for longer periods of time and less able to contribute their labour. Figure 5.1 further highlights the differences in spending on schooling for students based on their backgrounds. In monetary terms average per-pupil expenditure for students in the wealthiest quintile was four times higher than per-pupil spending for students in the fourth quintile and eight times higher than spending for children living in the poorest households. Obviously the estimates include contributions that would accrue both private and public benefits. Moreover, differences might be less acute if meal expenses were set aside. The important point here is that in spite of being part of the same education system, there is little doubt that the education experience of the rich and poor in government schools was dramatically different.

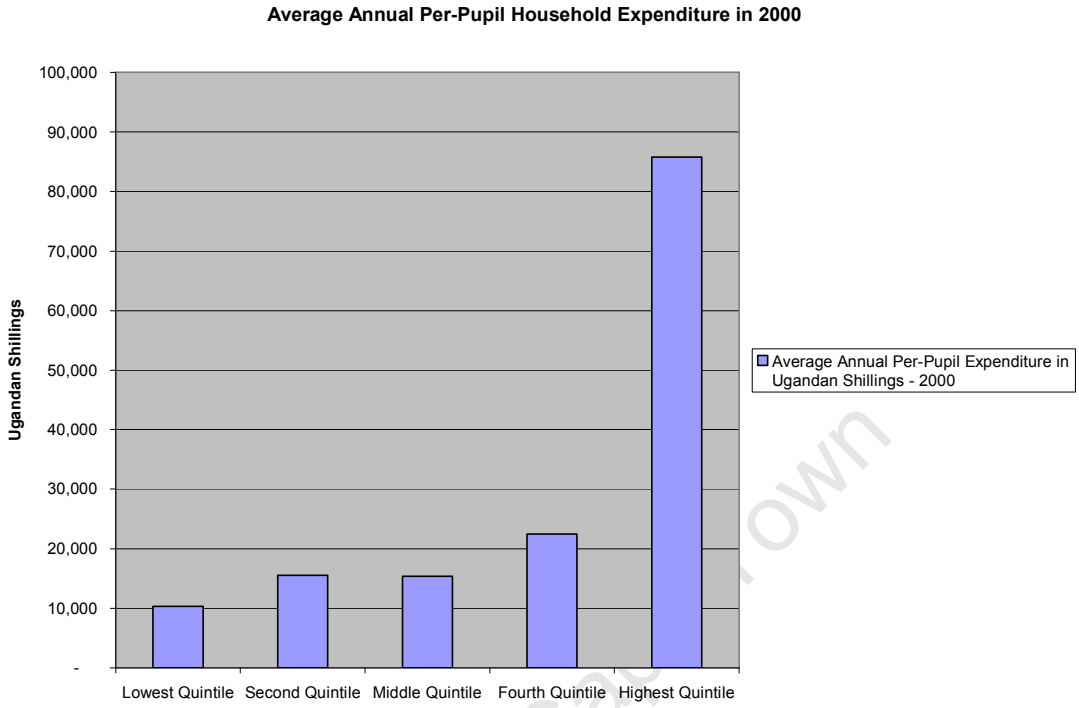
Table 5. 1: Percentage of Households in Different Wealth Quintiles Making Contributions to Primary Schooling Costs in Uganda During 2000

Asset Index	Tuition	Development Fund	PTA	Exam Fees	Uniforms and Clothing	Books and Supplies	Transport	Food
Lowest Quintile	5.4	45.6	12.8	11.8	77.2	97.3	0.5	10.0
Second Quintile	8.2	56.7	11.6	17.9	76.9	96.4	1.6	11.5
Middle Quintile	8.1	60.4	14.0	17.4	76.7	97.4	0.7	16.7
Fourth Quintile	13.2	61.1	15.7	20.1	78.1	98.0	2.9	22.7
Highest Quintile	37.4	57.3	27.8	29.7	85.3	98.3	14.1	44.0

Source: (Uganda Bureau of Statistics 2001, p.66)

a. These estimates reflect the percentage of total households *within* each quintile that contributed to different schooling costs. Therefore columns do not sum up to 100 per cent.

Figure 5. 1: Average Annual Per-Pupil Household Expenditure for Uganda in 2000



Source: Based on estimates from (Uganda Bureau of Statistics 2001, p.70)

5.4 Previous Ugandan Research

I have presented an extensive literature review on student characteristics and school effects in Chapter 2. In this section I take a brief look at empirical research into resource effects and primary school education in Uganda. Heyneman's seminal research into the quality of primary schools in Uganda in the 1970s stands out as one of the most ground-breaking studies of its time in a developing country. Using data from students and staff in 67 Ugandan primary schools within different localities, Heyneman isolated the characteristics of schools that influenced student performance on the national assessment at the end of primary school. It has frequently been described as the first Coleman study in a developing country because it provided some of the earliest conclusive evidence about the school's role in the scholastic development of students in poor countries (Buchmann 2000). Though this research can be criticised for many of the methodological and data failings common to that generation of research (for example ignoring the multilevel structure of the data, and using an unrepresentative sample), its findings about the

influence of the human and physical resources on students' educational careers were still meaningful (Heyneman 1976b; Heyneman et al. 1981; Heyneman and Jamison 1980; Heyneman and Loxley 1983).

This research contradicted the evidence emerging from industrialised countries at the time. It seemed implausible that the mere presence of basic school facilities could influence educational outcomes so significantly. Yet resources mattered and in a very meaningful way. Heyneman argued that in areas of extreme poverty, this finding had as much to do with the academic benefits of basic school facilities as with the underlying process at work to ensure that resources actually reached the schools where they were needed and when they were needed (Heyneman 1977). The strong association between academic achievement and certain school resources spoke volumes about the motivation of staff and communities to ensure necessary resources were available.

Like many developing countries emerging from colonial rule in the 1960s, it was commonly believed that the centralised administration of public education would ensure equal access to resources. Decisions regarding the purchase and distribution of supplies, the placement of teachers, the inspection of facilities and the powers of school administrators were determined by central authorities (Heyneman 1975; Heyneman 1977). In spite of these efforts, inequality in resource allocation persisted and was strongly related to the geographical location and to the social background of the students within the school (Heyneman 1975). Schools in urban settings with better off students seemed to acquire resources with greater ease, in spite of the seemingly equitable method of resource distribution.

The socioeconomic status of students in a school represents an important resource dimension (Barr and Dreeben 1983). Surprisingly, evidence from the literature of this period pointed to very weak linkages between academic achievement and student social background (Heyneman 1976a; Heyneman 1976b; Heyneman 1979). Researchers attributed this partly to widespread poverty in Uganda that limited its explanatory power and partly to a culture that appreciated the value of education for social mobility (Currie 1997; Heyneman 1976b; Heyneman 1979; Heyneman and Loxley 1983). To suggest that SES effects are generally stronger in industrialised countries seems to make intuitive sense, given that a higher percentage of low-income students are enrolled in school, but to argue that educational outcomes are completely independent of student social background in less industrialised countries leads to questions about the statistical and substantive basis of such research. The literature has long argued that socioeconomic status strongly influences

student achievement in countries at different stages of economic development and even in education systems that are increasingly merit-based (Blossfeld and Shavit 1993; Entwisle et al. 1997; Mare 1981). Particular attention has been given to how socioeconomic status and education reinforce inequality across generations because children of low socioeconomic status with fewer educational opportunities tend to be less competitive in the labour market (Bhorat 2004; Darling-Hammond 2007; Hauser 1970).

Claims of negligible SES effects on achievement in Uganda may have been overstated for a number of reasons that I briefly alluded to in Chapter 3. First, the sample used was not entirely representative of the primary school population in general. Because enrolments were still very low in the 1970s (UNESCO 1999), the relationship between socioeconomic status and achievement could have been suppressed. Implying that academic success was only related to the school environment ignored the fact that tuition costs at some state schools prevented the poor from enrolling. Therefore school attendance was still subject to a student's family background. Second, the measure of socioeconomic status was based on a selection of 'modern' items that might not have been contextually relevant predictors of wealth[25]. Third, and most critically, researchers failed to distinguish between the individual role of socioeconomic status on achievement and the collective effect that the socioeconomic status of the student body played on academic achievement and its equitable distribution. In other words, Heyneman and his colleagues ignored the fact that the collective effect of student social class on student academic achievement could actually reinforce inequality between students in the same school. This is not to say that his findings about the strength of school effects in Uganda were invalid, but rather that these conclusions about the absence of family-SES effects on achievement were quite possibly imprecise (Baker et al. 2005).

In summary, existing literature on Uganda generally supports the view that when resources are defined in terms of material inputs, they are strong predictors of educational quality. There is, however, less conclusive evidence about the relative importance of other dimensions of school resources in that country. Furthermore, there has been little research devoted to the role of resources in improving the social distribution of achievement within schools there. Weaker SES effects have been recorded in low-income countries but in this chapter I challenge previous claims that educational outcomes are unresponsive to student socioeconomic status and by extension, that policies to minimise SES achievement gaps are less imperative.

5.5 Research Questions

There are a number of school effects related to mass education that require attention. However I focus on the implications of these reforms for educational quality and social equity because many of the challenges in public education stem from unequal educational opportunities. I introduced the research questions for this thesis in Chapter 2. For convenience, I repeat questions relevant to this chapter below. The first question deals with how student background characteristics relate to academic achievement. The second question relates to the relationship between school resources and educational quality. The remaining question focus on whether resource effects differ depending on a student's background.

Average Reading Achievement and the Social Distribution of Learning in Uganda

a) *How do student background characteristics relate to reading achievement in the context of free primary education?*
b) *Is the presence of various forms of resources associated with average reading achievement?*
c) *To what extent does the equitable distribution of achievement based on socioeconomic status relate to the availability of resources in a school?*

5.6 Student and School Characteristics Used in the Uganda Study of Social Inequality

In this section, I provide descriptive evidence of variables used in the multilevel analysis. Details of how individual variables were constructed were presented in Chapter 3. The research questions covered here centre on policy-related issues that were most critically affected by the introduction of free primary education in 1997. I also considered other estimates that would have been impacted by UPE such as teacher quality and class size. However these constructs were unrelated to either school average reading achievement or to the SES gap and were dropped from the analysis. As I mentioned in Chapter 3, this is likely because patterns of variation in teacher quality and class size were unrelated to variation in reading achievement.

I include three student characteristics: grade repetition, gender and socioeconomic status. In Chapter 2, I described how parental education, parental occupation and family

wealth are the most common measures of socioeconomic status used in education surveys. Depending on data availability and the nature of the research questions, a combination of these factors have been used to capture a student's social background (Buchmann 2000). Research suggests a strong relationship between different dimensions of family status so that when they are combined, they represent a comprehensive index of student socioeconomic status (Baker et al. 2002; Nonoyama-Tarumi 2008). In addition to the traditional measures of wealth and family background, the use of culturally specific items has proven to be highly reliable in international surveys (Fuller et al. 1995; Lee et al. 2005; Postlethwaite and Ross 1992).

The index of socioeconomic status used in this study consisted of information on household possessions, parental education levels and the structural features of the home. I provide a detailed description of how this variable was constructed in Appendix 3.1. The issue of academic support is not explored here and I do not adjust for it at the student level as I did in Chapter 4, where it was used to represent gender-related differences in academic support outside of school. Because students repeat an entire grade and not a single subject, the proportion of repeaters in Uganda is the same for reading as it is for the mathematics descriptive statistics presented in Chapter 3 (see Table 5.2 below).

Table 5. 2: Grade Repetition and Literacy Achievement of Grade 6 Students in Uganda

	Uganda Reading Achievement		
	Repeaters	**Non-Repeaters**	**Total[a]**
Sample Proportion	1382	1260	2642
Reading Achievement	472	499	485
SES[b]	-.08	0.08	0.00

Source: SACMEQ Data Archive Version 4.0 (own calculations)

a. Estimates for the total sample (repeaters and non-repeaters combined). The sample of students who took the literacy test (2642) is slightly more than the sample for the mathematics tests (2619) because of student absences.
b. The SES variable is in a standardised (z-score) metric, mean (M)=0, standard deviation (SD)=1 within Uganda.

Student test scores for reading are 0.15 standard deviations (SD) below the SACMEQ mean of 500 for reading. Predictably, students who have repeated a grade have lower achievement scores. What is also noteworthy is that the socioeconomic status of non-

repeaters is 0.16 SD higher than for repeaters. Gender-related achievement differences for the reading test were negligible compared to the differences in mathematics that were reported in the previous chapter[26]. The socioeconomic status of girls in Ugandan government schools was 0.25 SD higher than for boys (see Table 5.3). In Chapter 4, I pointed out that more boys than girls are known to have re-enrolled at higher grades after UPE was introduced (Appleton 2001), which could partly explain the sizeable socioeconomic gap between boys and girls in this Grade 6 sample.

Table 5.3: Gender Differences and Literacy Achievement of Grade 6 Students in Uganda

	Uganda Reading Achievement		
	Male	**Female**	**Total[a]**
Sample Proportion[a]	1483	1159	2642
Reading Achievement	484	487	485
SES[b]	-.11	.14	0.00

Source: SACMEQ Data Archive Version 4.0 (own calculations)

a. Estimates for the total sample (male and female combined).
b. The SES variable is in a standardised (z-score) metric, mean (M)=0, standard deviation (SD)=1 within Uganda.

In Table 5.4, I compare average differences in school characteristics in urban and non-urban areas of Uganda. It is often argued that one of the immediate impacts of UPE is that resource allocation and educational quality favour schools in urban settings that are able to access government offices easily and to ensure timely resource delivery. The majority of schools in the sample are situated outside urban centres. However, average reading achievement is considerably higher in schools that are situated in urban areas. It is interesting that differences in the distribution of teaching resources and in the teacher workloads are negligible. In contrast, the allocation of physical resources and the average socioeconomic status of the school favour urban areas. The model for Uganda also takes cognisance of the age distribution of Grade 6 students in the school because many of the children entering the education system after the introduction of UPE were older than the official age for the grade. Children in remote rural areas often start school later because of safety issues related to walking long distances to school. The presence of older students who may have experienced periodic gaps in their schooling can place immense pressure on schools and teachers. On average, students living outside of urban areas are nearly one year older than children attending schools in urban centres.

Table 5.4: Descriptive Information on School Location in Ugandan Primary Schools

School Location		Average SES	Average Teaching Hours (Weekly)	Average Age of Students (Years)	Teaching Resources	Physical Resources	Average Reading Ach.
Non-Urban	Mean	-.05	17.1	14.3	.00	-.06	481
	N[a]	152	148	152	148	152	152
	SD	.95	8.6	0.96	1.01	0.96	73
Urban	Mean	0.70	16.5	13.4	-.04	.86	522
	N	11	11	11	11	11	11
	SD	1.43	6.5	.73	.95	1.23	74
Total	Mean	.00	17.1	14.2	.00	.00	.00
	N	163	159	163	159	163	163
	SD	1.00	8.4	0.97	1.00	1.00	74

Source: SACMEQ Data Archive Version 4.0 (own calculations)
a. 'N' represents the number of schools

Because UPE targeted state-owned schools, it is also useful to control for the quality of education in different sectors (Table 5.5). Unsurprisingly, all resource and achievement indicators are higher in private schools. On average, students in private schools are younger and benefit from superior access to physical and teaching facilities. The average SES in private schools is over 1 SD above the population average. Average student performance in private primary institutions is 0.75 of a SD above performance in government schools.

Table 5.5: Descriptive Information on School Sector in Ugandan Primary Schools

SECTOR		Average SES	Average Teaching Hours (Weekly)	Average Age of Students (Years)	Teaching Resources	Physical Resources	Average Reading Ach
Private	Mean	1.06	13.1	16.4	.12	.82	555
	N[a]	9	9	9	9	9	9
	SD	1.36	.90	7.6	.92	.72	67.96
Government	Mean	-.06	14.3	17.1	-.01	-.05	480
	N	154	154	154	150	154	154
	SD	.94	0.93	8.4	1.01	.99	72.39
Total	Mean	.00	14.2	17.1	.00	.00	483.96
	N	163	163	163	159	163	163
	SD	1.00	0.97	8.4	1.00	1.00	73.97

Source: SACMEQ Data Archive Version 4.0 (own calculations)
a. 'N' represents the number of schools

5.7 Multivariate Results

The descriptive evidence on students and schools has shown fairly typical patterns, with achievement advantages among students with a better social and academic background and among well resourced schools in urban settings. The next section will show how student and school factors related to achievement within a fully integrated multilevel model. Such analysis is particularly well suited to testing the relationship between covariates that describe schools and outcome variables that identify students.

5.7.1 Results of the Fully Unconditional Model

I explained in Chapter 3 that the first step in developing a full multilevel HLM model is to partition the variance in the outcome variable (reading achievement) into its within-school and between-school components. This HLM procedure generates a "fully unconditional model," in that it is not conditioning on any independent variables. Table 5.6 displays the results of this analysis. It reveals that 58 per cent of total variation in reading achievement existed between Ugandan schools at the time of the survey and that the remainder (42 per cent) was due to achievement differences between students within the same school. Even compared to a high percentage of other countries in Southern and Eastern Africa, the ICC for Uganda is high (Lee et al. 2005), meaning that inequality was concentrated at the school level rather than at the student level at this time. The estimation also generated a chi-squared statistic for the variance components. It confirms that these differences in average test scores between schools were statistically different and a multilevel approach to explain these differences was indeed appropriate. The outcome variable is reliably estimated (0.95 where perfect reliability is a value of '1'), which increases confidence in the estimation results.

Table 5.6: Variance Decomposition for Literacy Achievement in Ugandan Primary Schools

	Uganda
Average Reading Achievement	485
Average Within-School Sample Size[a]	16.21
Total Variance Within Schools (sigma-squared)	3679.04
Total Variance Between Schools (tau)	5212.42
Intraclass Correlation (ICC) (a)	0.58
Reliability (lambda)	0.95

a. ICC = tau/(tau + sigma-squared)

Source: SACMEQ Data Archive Version 4.0 (own calculations)

a. The average number of students within each school in the sample.

5.7.2 Results of the Within-Schools Model

In Table 5.7 I present the results of the within-school HLM model. It addresses the first research question concerning the influence of student background characteristics on reading achievement. I include three independent variables to adjust for student background characteristics. Obviously, student socioeconomic status appears as a focus variable because it is at the core of the analysis of the social distribution of learning. It is standardised so that results can be interpreted in terms of standard deviation units. In addition, I include two control variables – one for gender (coded '1' for female students) and one for grade repetition (coded '1' for repeaters). Details of how these variables were created were discussed in Chapter 3. I followed previous conventions outlined in Chapter 3 and centred the slope of the focus variable (here socioeconomic status) on its school mean. At the same time, I relaxed the assumption that all schools had an identical estimate of SES by allowing the slope for SES to vary. Grade repetition and gender were centred on the population mean and the slopes were fixed to reflect average values for the population as a whole. The results confirm that student characteristics are important predictors of achievement. In particular, student SES had a positive and significant effect on achievement. A one standard deviation increase in SES was associated with an eight point increase in reading achievement. The results of the chi-square test also confirm that the relationship between SES and reading achievement differed between schools in a manner that is more than just random.

Figure 5.2 illustrates this relationship more clearly. By plotting the distribution of achievement scores by SES across a random sample of Ugandan schools it is quite clear that the relationship between SES and Grade 6 reading scores differed. Although generally positive, in some schools the slope was very steep (large differences in performance between students based on their socioeconomic backgrounds), whereas in other schools, the slope was fairly flat (a weak SES effect). These differences in the relationship between SES and achievement in each school would drive the final school effects model to identify which characteristics of schools narrowed gaps in performance based on social background. What is also noteworthy is that the length of the line varies but it is not systematically related to achievement levels. The length of the line represents the range of SES levels within a school. A short line would indicate that most students are quite similar in socioeconomic status. One might have expected a pattern of elite primary schools to be emerging (i.e. short lines with high SES and at high achievement levels) but in general it appears that students of varying backgrounds were enrolled within the same school at this time.

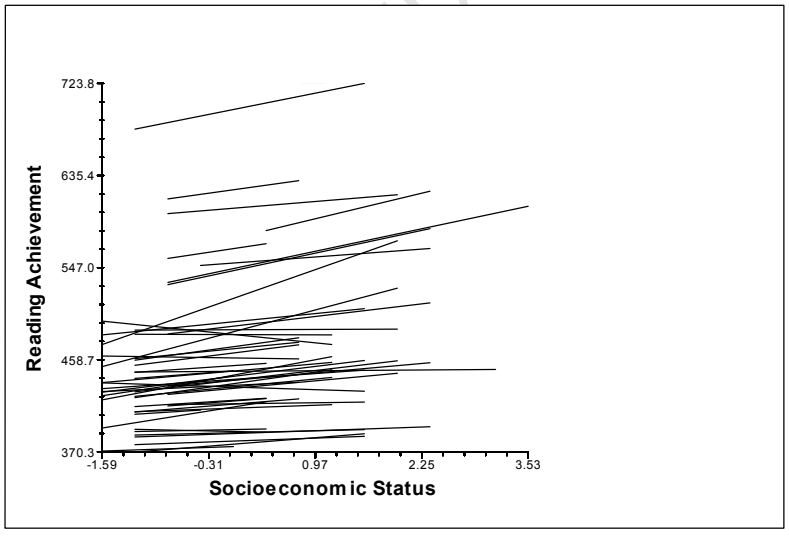
In addition to information on SES, other student background variables provide useful insights into student performance. With other background characteristics controlled for, female students and students who have repeated a grade are expected to have poorer literacy scores. I explained in Chapter 4 that the repetition gap is an important adjustment because it is an indicator of academic preparedness. Students repeat a grade for different reasons related to their home and school environments. Irrespective of the reasons for repetition, the results seem to suggest that student retention is associated with poorer academic outcomes (Brophy 2006).

Table 5.7: Level-1 HLM Models for Literacy Achievement in Ugandan Primary Schools

	Uganda
Fixed Effect	
Intercept	484.08***
Socioeconomic Status	7.63***
Grade Repetition	-18.49***
Female	-7.58**
Random Effects	
Mean Achievement	5159.92***
Student SES	152.50**
Rij	3465.49
Reliability of OLS Regression-Coefficient Estimates	
Mean Achievement	0.96
Student SES	0.25

Source: SACMEQ Data Archive Version 4.0 (own calculations)

Figure 5.2: SES and Reading Achievement for a Random Sample of Ugandan Primary Schools



5.7.3 School Resources, Achievement and Social Inequality

In Table 5.8, I summarise the results of the multilevel model-building routine. I begin by including a set of school-level statistical controls for sector, location and the age composition of students. I then group resource variables into four categories: school social composition, physical resources, teaching resources and weekly teaching hours. The order that variables enter the multilevel model is guided by their potential responsiveness to policy changes. Therefore more fixed factors (social composition) precede more amenable factors (teaching resources and teaching hours). I also discuss indirect effects based on changes to coefficient values as variables representing different resource effects are added to the model. The first five models identify school effects related to educational quality (models of the intercept). The final model includes variables that explain the SES/Achievement gap.

Model1: Statistical Control Variables

The majority of primary school students in Uganda attend government-owned schools situated in rural areas[27]. It was nevertheless necessary to introduce statistical controls for school sector and school location before considering the relationship between resources and achievement. Urban schools and private schools are known to have an advantage over state schools situated in rural areas. Shorter distances to school are thought to shore up attendance among poor children living in urban centres compared to poor children living in remote rural areas (Lockheed and Verspoor 1991). A more representative sample of students may have a negative effect on average test scores in a school.

Owing to the unusually wide age distribution when students flooded into primary schools, I also controlled for the average age of Grade 6 students. Not surprisingly, test scores are age dependent. Schools with an older cohort of Grade 6 students had lower average achievement scores. This is after allowances have been made for the intake quality by controlling for student repetition history. Unsurprisingly, the average test scores in government schools were nearly 40 points below the score for students in private schools.

Model 2: Social Composition of Schools

The achievement advantage experienced by private schools and schools with a younger cohort of Grade 6 students is partially explained by the average social background of students within a school (Model 2). This implies that low performing government schools with older students also tend to enrol students who are socially disadvantaged.

The relationship between social class composition and educational outcomes has generated much interest in sociological circles. There is no shortage of theories as to why, even in developed settings and in the midst of industrial progress, expanding educational opportunities may not be accompanied by diminished differences in performance between students with different family backgrounds. Explanations for why social inequality in achievement persists generally point to the central role that private education investments play when it comes to supporting the formal schooling process (Blossfeld and Shavit 1993). For example, some research has found that low-SES students risk serious academic setbacks, especially during school holidays, because they have little exposure to social environments where what is learned at school is reinforced (Entwisle et al. 1997). Of interest to policy is how the school environment can reverse these severe setbacks.

Models 3 and 4: Physical Resources and Teaching Resources

The physical resources available at a school also had a positive and significant relationship with reading achievement, over and above the influence of a school's social composition (Model 3). A similar pattern was evident for teaching resources (Model 4). Interestingly, there was a slight attenuating effect on the coefficient for the social composition of schools when these resource variables were included. It points to an underlying relationship between the level of resources and the social composition of students within the school. The cross-sectional nature of these data bars any discussion of the direction of this relationship. Are wealthier students drawn to better resourced schools or does their presence at a school raise the likelihood that parents will ensure that schools are properly maintained? The literature on Uganda seems to suggest that both scenarios may hold some truth. Historically, the presence of strong and active PTAs seems to have influenced the sustained quality of school facilities. Bray would add that customs of community support for local schools are stronger among certain groups in society. This would lead to high levels of involvement in school maintenance in certain areas. (Bray 1996).

Model 5: Teaching Workloads

The fifth model in the series reveals how, on average, longer teaching hours are related to lower average reading scores for the school. The importance of this result cannot be overstated. Because the projections about enrolment increases grossly underestimated reality (World Bank 2002), government struggled to provide adequate numbers of trained teachers, especially in rural areas. It is interesting that the variable representing teacher workloads appears to be unrelated to other resource effects. It represents an independent resource dimension that remains important over and above the facilities available in the school or the social composition of the students within the school. It surely underscores a mismatch between the level of expectations imposed on Ugandan teachers and what their actual capacity was. Most were unprepared for the task of teaching large numbers of students with different levels of academic preparation. No doubt, in such an environment, less time was available for individual student attention. It is hardly surprising then that the negative effect of longer teaching hours on average test scores was more serious for socially disadvantaged students as shown in the final model of intercepts and slopes below.

Final Model of Intercepts and Slopes

In the final model, the resource effects for average reading achievement (the intercept) and SES/Achievement differences (the slope) are modelled simultaneously. My intent was to identify resource characteristics that would produce a positive coefficient on the intercept (more effective) and a negative coefficient on the slope of socioeconomic status (more equitable). The final model explained 23 per cent of variance in reading achievement and 25 per cent of variation in the SES slope.

The results are quite informative. First, although overall achievement was higher in schools with a higher average SES, wealthier students were the main beneficiaries in such an environment. Second, in the same way that the social composition of schools led to gains for more affluent students, heavier teacher workloads inflicted the most harm on poor students. The two results are related. Because many of the costs of schooling (such as meals and stationery) remained after 1997, this may have led to severe social stratification within schools. One reason why the social composition effect is so strong is because it is linked to the influence of individuals within the community. If this is the case, then the possibility of preferential treatment for students based on their parents' status in the community cannot be ruled out. The measure of social composition probably captures some of this effect. According to one study, influential members of local communities do

not hesitate to use their status for their children's benefit at school (Bray 1996). In the same way, overburdened teachers tend to focus their attention on students whose parents may show them favour.

In effect, poor household members find themselves subsidising school systems that are tailored to middle class families because they lack the hidden currency of local status. The influence of the poor on the internal operations of a school is tentative at best. Teachers are known to read out the names of children who fail to make financial contributions to a school and to send them home (Alubisia 2005; Rajani 2001). Such practices tend to reinforce the notion that only certain students were worthwhile teaching. It is interesting that a significant interaction effect was detected between teaching resources and average social background. The existence of such an interaction strongly suggests that the positive effect of teaching resources on reading achievement is greater in schools where the average social background of students in the school was higher.

Perhaps the most encouraging result of this study is that access to physical resources had a meaningful effect on overall achievement and that gains were concentrated among less privileged students. This is a key finding because it indicates that the physical environment of a school can reverse the disadvantage faced by students from poor homes. A direct policy implication of this finding is that it endorses strategies such as the School Facilities Grant. As previously stated, this was a policy that was specifically designed to assist poorer schools upgrade their infrastructure but that required the school's input to apply for funding.

Figures 5.3 and 5.4 further illustrate these findings. In Figure 5.3, the average reading scores are represented for different social class climates. As average social background increases, so does the slope in achievement between students based on their socioeconomic status. In contrast, Figure 5.4 highlights how resource effects not only have a positive effect on average achievement (the intercept) but the slope that corresponds to higher resource levels is flatter, thereby reflecting greater social equity as resource levels increase. It is worth mentioning that the resource effects seem to be particularly strong at the lower levels (see Figure 5.5); the difference between the 25th and 50th percentile is much greater than the corresponding difference between the 50th and 75th percentile. This makes intuitive sense. The marginal achievement gain will surely be stronger in a situation of scarcity, where even the most basic improvements to the education environment will be a significant step forward than in situations where resources are adequate. Of course the question of causality arises once again. Students who have fewer available alternatives to

supplement their education are likely to suffer the most from resource scarcity in a school. Therefore a sudden increase in enrolment would have the effect of stretching resource levels thinly, leading to declines in school quality that would be more acute among low-income students. Without longitudinal data it is impossible to determine the direct sequence of events. Nonetheless, there is ample evidence to conclude that school facilities were related to educational quality in this context in ways that should note be overlooked.

Table 5.8: Results for Ugandan Model of Education Quality and Social Inequality

	Model 1	Model2	Model 3	Model 4	Model 5	Final
Intercept [a,b] (Average Achievement)	519.67***	507.43	501.19***	500.55***	500.87***	504.62***
Urban School Location	6.99	3.33	-7.38	-6.68	-5.42	-2.58
Government School Sector	-38.22~	-25.00	-17.66	-17.02	-17.40	-21.58
Average Age	-29.78***	-10.14~	-9.78~	-10.36~	-10.94~	-9.66~
Average Social Background		33.77***	30.22***	29.47***	28.96***	27.82***
Physical Resources			13.55*	13.35*	12.11*	11.61**
Teaching Resources				8.02*	9.24*	10.09*
Teaching Resources x Average Social Background						10.57*
Weekly Teaching Hours					-7.81~	-7.67~
SES/Achievement Slope	7.78***	7.87***	7.87***	7.87***	7.86***	7.05**
Average Social Background						5.04*
Physical Resources						-3.96*
Weekly Teaching Hours						-3.90*
Random Effects						
Intercept, $\mu 0j$	4073.28***	3384.44***	3256.59***	3211.57***	3175.54***	3123.52***
SES slope, $\mu 1j$	155.03**	158.69**	154.92**	154.82**	158.09**	115.62~
Level-1 error, rij ($\sigma 2$)	3464.78	3463.48	3464.80	3464.96	3463.62	3467.75

Source: SACMEQ Data Archive Version 4.0 (own calculations)

~ p < .10; * p < .05; ** p < .01; *** p < .001

a. Only the SES achievement slope was allowed to vary between schools and was centred on each school's respective mean.

a. Because the within-schools models are the same as those shown in Table 5.6, they are not repeated here.

Figure 5.3: SES/Achievement Gaps for Different Resource Levels

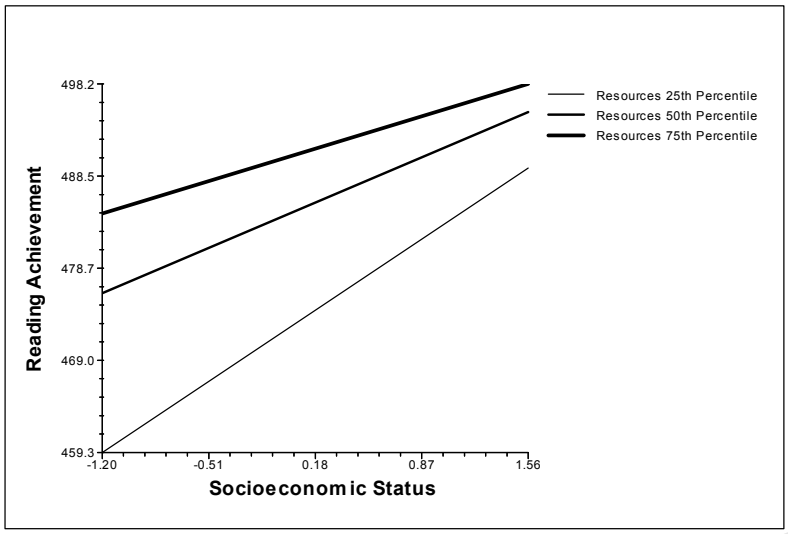
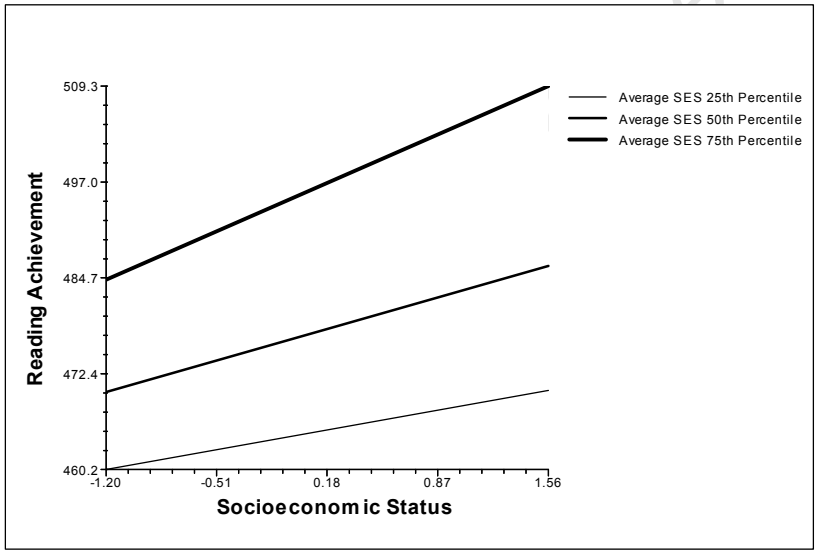


Figure 5.4: SES/Achievement Gaps for Different Levels of Average SES



5.8 Summary

In this chapter I sought to clarify the relationship between resources and educational quality in general and to identify how effectively resources could be in reducing social disparities in learning outcomes. Uganda presented a suitable context to pursue the question of how education systems in transition should invest in public schooling because access to primary schools had been increased. These changes led to adjusted decision making depending on whether households were enrolling children in school for the first time or whether households with children already attending school were modifying their conduct to cope with the changing face of education. I began by providing a description of the patterns of achievement among students and schools in Uganda before turning to the statistical analysis.

Results from this chapter support the handful of studies that have endeavoured to rethink the relationship between socioeconomic status and achievement in the third world (Baker et al. 2005; Lee et al. 2005; Niles 1981) with a view to creating the most educationally desirably environments for poor students. (Buchmann 2001; Niles 1981). The literature has long suggested that this phenomenon is enduring even among economically advanced countries (Blossfeld and Shavit 1993). Nor are social class differences an urban phenomenon because they persisted even after controlling for urbanicity.

Although in relative terms, achievement differences between schools in the sample were more important than differences between students attending the same school, student socioeconomic status had unambiguous positive effects on literacy achievement. Student social background is particularly important in socially mixed learning environments. How a student's SES compares to the norm for the school will influence a student's status among peers and may even affect how responsive teachers are (Burstein et al. 1980). Researchers have often criticised the use of inappropriate SES measures in developing country contexts (Buchmann 2000; Fuller and Clarke 1994). In this analysis I used a highly robust measure of socioeconomic status that incorporated information on parental education, household assets and the structural quality of the home. As in the previous chapter, reading achievement scores for Ugandan girls were lower but the effect sizes were much smaller for reading than for mathematics. The same was true for grade repetition.

This chapter was a further extension of the school effects theme that was introduced and explored in earlier chapters. The central conclusion of the multilevel analysis was that equality of access to formal primary education did not necessarily translate to equality of

outcomes. Because of the narrow definition of free education, households were still required to make substantial contributions to schooling. Added to this, administrative weaknesses increased the demand for private contributions and this helped to fuel social inequality in schools. Inevitably, the private costs required for education proved to be extremely prohibitive for the poor. Results of this analysis that related to school social composition provided a clear picture of the reality of social stratification in primary education. A school's average socioeconomic status was related to general improvements in educational quality but it was also related to wider gaps between rich and poor students. Because of the scarcity of private resources among poor families, the ratio of private direct costs relative to private resources would be much higher. Added to these difficulties, there were greater indirect costs that stemmed from a higher demand for child labour. It is quite apparent that greater provisions are necessary if poor students attending state schools with more socially advantaged peers are to benefit from public education. I have also shown that heavier teaching workloads had the most damaging effect on low-SES students with fewer private resources to devote to academic processes. It would seem that greater support for teachers is an important ingredient in an equitable education system.

The results presented in this chapter lend empirical support to the view that material inputs are a positive influence on educational quality in developing countries. I have shown that policies that promote physical resource availability can lead to substantial equity gains. School facilities were important for educational quality over and above the influence of the social composition of the school. Chapters 4 and 5 have shown how educational quality and equity can be influenced by the educational domain. In Chapter 6, I will discuss all of the school effectiveness findings presented in this thesis and underscore their policy implications. I will also make suggestions for further work.

CHAPTER 6:
LESSONS LEARNED

6.1 Introduction

I began this thesis by asking how the quality of education in African primary schools could be raised. Three criteria are typically used to assess progress of educational reform in developing countries: whether education has become more accessible, whether the presence of educational inputs has been found to be systematically related to better student performance and whether the school environment has encouraged a more equitable distribution of learning outcomes between students of different backgrounds. I considered the second and third components in Kenya, Tanzania and Uganda, three neighbouring countries with close ties that face similar educational challenges. Using a suitable methodology I set out to determine whether explanations for school effectiveness and the gender gap favouring boys in mathematics could be generalised across East Africa. There was another reason for raising these questions in multiple settings. The growing popularity of international assessments of education has raised important questions about the correct empirical strategy to adopt when analysing cross-national data of schooling systems.

In addition to the cross-national analysis I developed a separate discussion around social inequality and school effects in Uganda, an educational context where measures had been introduced to increase accessibility of primary schooling among the poor. The introduction of free education preceded the collection of the data used in this thesis by two years. Within a short period of time Uganda's schools experienced a massive influx of poor students. These were not the first attempts by African countries to achieve mass education. In Chapter 1 I discussed how the 1970s and 1980s were peppered with examples of countries chasing this goal. This has led one author to comment on the "ominous sense of déjà vu" when documenting recent efforts to increase the availability of high quality primary education (Wedgwood 2007, p.383). The aim of this part of the study was to gain clarity on how public investment in education could overcome student disadvantage under these circumstances.

Chapter 1 began by discussing the role of education in developing countries. Recent scholarship on educational reform has assumed that solutions for how to raise educational quality are in conflict with strategies for redressing inequality. I took the view that when evaluating schooling systems it is essential that improvements in both areas be jointly pursued. Chapter 1 also traced the educational histories of the region starting from the

period before independence where the education of African population was crafted around the needs of the colonial authorities and continuing through to the decades leading up to the survey period. The historical evidence showed that across time, internal and external institutions competed with one another to direct school reforms.

The theoretical and empirical background detailed in Chapter 2 was built around existing research on school effectiveness. The basis of this research lies in identifying which elements of the school environment were associated with higher academic achievement and improved learning opportunities for disadvantaged students. The first part of the chapter described how student background characteristics related to academic performance. It also explained why it was important to equalise for student background characteristics before asking questions about the positive scholastic impact of schools. I separated the review of the literature on school effects into evidence for developed and developing countries. School characteristics were categorised as referring to a school's composition, structure, resource base and organisation. The review showed that although most studies based on developing countries focused on human and material inputs, evidence of the role of school structure and organisational efficiency were slowly beginning to emerge.

At the end of Chapter 2, I presented the conceptual model that would frame the subsequent analysis. The research model identified the main pathways through which the educational environment would be related to student outcomes. The cross-national analysis would address issues of school effects on mathematics achievement and the gender gap in achievement. The individual analysis of Uganda would provide insights into how resource related characteristics contributed to higher-achievement and its social distribution. Each analysis would control for student background characteristics.

Chapter 3 introduced the data, sampling and the statistical methodology. Data for the thesis originated from the second wave of the SACMEQ study and were collected at the end of 2000. In addition to describing the study, I detailed the advantages and disadvantages of the data and how student and school measures were constructed. I used the data for descriptive comparisons of the sample of students and schools in the three East African countries. Chapter 3 also presented the rationale for using multilevel modelling in analysing these data. It was broadly based on the nature of the research questions and the structure of the data. Multilevel modelling was compared to traditional regression techniques and some of the statistical issues that arose from using this approach

were discussed. The chapter ended with a discussion of comparative studies of educational quality that would pave the way for the three country study in Chapter 4.

In Chapter 4, the first series of empirical results were presented. They addressed the research questions relating to a) Student background and academic achievement in Kenya, Tanzania and Uganda, b) School effects and average mathematics achievement in the three countries and c) School effects and the gender gap in East African primary schools.

Chapter 5 presented the second series of results that questioned how the availability of resources related to literacy achievement in Uganda. Part of the chapter also considered the differential effectiveness of resources depending on a student's socioeconomic status. In the concluding chapter I will provide a summary of the key findings and their policy implications. I will also discuss the limitations of the thesis and conclude by providing a commentary on the future role of school effectiveness research in Africa.

6.2 The Results and Their Implications

Ultimately, this thesis has been about comparing schooling systems to develop strategies for improving educational delivery. In the broadest terms I have made these comparisons across education systems. Within the same education system, the focus turned to whether the choice of school mattered, and within individual schools, the emphasis has been on evaluating achievement differences between students within the same school. In summarising the findings I draw on the thesis as a whole rather than results from individual chapters. I discuss the implications in terms of their policy relevance wherever possible.

6.2.1 Effectiveness and Equity: Different Sides of the Same Coin?

Throughout this thesis I have emphasised solutions for improved schooling that simultaneously benefit educational quality and its equitable distribution. The tasks faced by some schools in developing countries are daunting and it would seem that simply maintaining minimal standards of competency would be an achievement in and of itself. I have maintained that African schooling systems need to move beyond the symbolic significance of education. If schools are to be used to enrich the human capital base in developing countries, then effective and equitable learning environments need to be created.

Findings from this thesis were mixed in this regard. On the one hand there was some evidence to support the view that school factors could be related to improved quality while simultaneously benefiting the most disadvantaged group. The presence of material inputs in Ugandan schools was related to higher literacy achievement and the effects were strongest for poor students in under-resourced areas. On the other hand, the pattern of results on academic achievement and the gender gap told a somewhat different story. Although the analysis demonstrated the presence of school characteristics that were associated with overall academic success, they tended to benefit boys more than girls, thereby increasing the gender gap. This pattern was also found in the social inequality model for Uganda where a higher average socioeconomic status in a school and lighter teacher workloads were related to higher achievement, but greater gains were experienced by more socially advantaged students. Another scenario presented itself when I considered the gender composition of schools in Kenya. In this instance, schools with a higher concentration of female students achieved lower test scores but were more equitable. Low quality was combined with high equity implying that all students performed equally poorly.

That the combined evidence on effectiveness and equity is so mixed should hardly be surprising given that the underlying roots of inequality are highly complex. The root causes of gender-based inequality in schools are closely tied to the cultural context in which learning takes places (Baker and Jones 1993; Marks 2008; Mensch and Lloyd 1998). Social inequality is also related to the social, economic and cultural environment but the pathways through which the school environment can address these challenges may differ. The bottom line is that not all inequality is equal and that there is no single model of African education to be advanced. What these results should motivate is further study of what it is about certain school environments that makes them productive for some students and not for others.

Policy practitioners also need to recognise that they may find themselves chasing moving targets in pursuing the goals of effectiveness and equity. Baker and LeTendre (2005, p47) point out that even in the most egalitarian societies, elements of persistent inequality seep into the education system "…like water under heavy pressure through the best of seals." As accessibility increases, the social mix of students in schools will intensify. Even if educational reform succeeds in making schools more alike in terms of the delivery of educational inputs, social inequality in schools can continue to challenge education systems (West and Pennell 2002). Equalising opportunities to learn will require ongoing innovations to bridge achievement gaps between advantaged and disadvantaged groups.

6.2.2 How should international assessments of school effects be carried out in developing countries?

Comparative analyses can be indispensable tools for understanding educational quality. From a policy outlook, increasing transparency about the quality of schooling in different settings is useful because it encourages accountability (Rubner 2006). In some instances, international assessments have stimulated highly constructive responses such as healthy debates about educational reform. Depending on which side of the fence countries have landed, survey results have been a source of reassurance or the necessary catalyst for change. Torney-Purta described the "sense of national embarrassment" experienced in the United States when the results of international studies were published in the 1980s (Torney-Purta 1990, p.32). Similarly, Germany fell into a state of collective shock when the results of the PISA studies were made available to the general public (Baker and LeTendre 2005; Rubner 2006).

Exposing inter-country differences in academic performance has received criticism in some quarters. In extreme cases unfavourable findings have led policy makers to reject entire studies (Postlethwaite 2006). Some researchers wonder whether international studies have gone too far and become too politicised. Baker and LeTendre (2005, p.164) warn of "…a reform crazed educational world…" less interested in student development because policy makers are obsessed with outdoing their economic rivals. Politicising the educational debate may have its risks but this is not reason enough to abandon international studies.

In a way international studies have the advantage of being a more neutral assessment of educational quality. The benefits of creating a neutral ground for comparing national policies and practises should not be under-estimated. In the past, educational reform has been devastated by the weight of political interference. Haphazard implementation has been followed by expensive damage control and sometimes the consequences have been irreversible for entire cohorts of students. East Africa is no exception. Often national policy has been based entirely on the ideology of a country's leaders. In Tanzania, there was Nyerere's villagisation. Kenya implemented Moi's 8-4-4 system and Uganda's recent UPE policy has been closely linked to President Museveni. This has made it extremely difficult to amend a failing policy. Because countries participate voluntarily in these assessments, it makes it easier to assess educational progress without bruising political egos.

One of the most useful facets of cross-national research is that it allows lessons to be drawn about which public investments in education are proving effective. Posing key questions about how schools can be made effective in different settings can be a useful preliminary step to a more refined analysis. This is especially so when strong patterns

emerge across countries at similar stages of economic development or where economic systems are highly integrated. No doubt better data on a wide circle of education systems and refined statistical tools have increased the possibilities for secondary analyses. The challenge facing education policy makers is which approach to adopt when carrying out cross-national analysis of educational quality. Obviously interest in educational issues across borders needs to be balanced against the contextual realities of the countries involved. The temptation is to use very broad brushstrokes when shaping comparisons but this could easily produce misleading findings.

Perhaps one would have expected that issues related to educational quality, school effects and gender to be more uniform in Kenya, Tanzania and Uganda because of their geographical proximity and close links. At times, the pattern of school effects on achievement was fairly consistent, especially for Kenya and Tanzania, but the analysis also revealed that school-by-school differences in composition, structure, resources and organisation did not always explain effectiveness and equity in the same way. One possible reason for these results is that certain variables had a different meaning in different countries (even though there was considerable local input in the survey process). This raises the question of what to make of inter-country differences in educational quality and how to maximise the benefits of cross-national analyses.

Whether or not opportunities to learn are related to similar factors across national boundaries, comparing the quality of education across countries remains worthwhile if the empirical approach is based on some substantive rationale. Cross-national analyses are valuable for providing an impartial assessment of a) the dispersion of inequality, b) correlates of educational quality and c) how different schooling systems have managed to overcome serious disadvantage. However researchers would do well to supplement these efforts with detailed analyses of individual countries. In fact, comparative studies ought to be considered as part of a broader analytical scheme (Chabbott and Elliot 2003). Replicated studies are a useful first step but hardly the final word on what is driving academic success.

6.2.3 What are the priorities for educational reform in East Africa?

It is sometimes argued that more money spent on schooling will automatically yield better results in any school system. The central argument that runs through this thesis is that to optimise benefits to students, recognition of the interplay between student background and the environment of schooling is what will translate into better and more equitably distributed educational outcomes. It is both interesting and important that this

region is connected in so many ways but there is so much that is unique about each country's situation in the snapshot in time that the survey represents. Ultimately explanations for what made primary schools function most effectively reflected these nuances.

Grade Repetition

Many of the findings in this thesis were consistent with existing claims that grade repetition is ineffective in improving educational quality (Hong and Bing 2007; Jackson 1975; Westbury 1994). Evidence of the ineffectiveness of repetition policies raises questions about the best intervention strategies for repeaters. Many alternative measures involve some form of remedial instruction (Entwisle et al. 1997; Haddad 1979; McCoy 1998). Across countries, student achievement was lower for repeaters. Critics of repetition policies maintain that they are not systematically related to academic performance, and that they are costly to the education system. They argue that these policies are heavily influenced by non-academic factors in a student's life. It has been suggested that repetition may have a serious impact on student self-concept and that it can ultimately lead to drop-out (Haddad 1979). It is unclear whether and to what extent the academic treatment of repeaters varies between schools and across the three East African countries. This is an area that requires further attention.

Repetition rates in developing countries tend to be much higher than in developed countries (Lockheed and Levin 1993) especially in earlier grades (Haddad 1979). One of the drawbacks of these data is the difficulty in distinguishing between academic and non-academic determinants of repetition. The results from the Kenyan model of school effects seemed to suggest that there could be positive effects of repetition at the school level but the reverse was true for Ugandan primary schools. I argued that the Kenyan results spoke more of the organisational climate in schools where repetition was high. Studies indicate that repetition is prevalent in the later grades of Kenyan primary schooling because of interest in performance in secondary school entrance examinations (Abagi and Odipo 1997). Further study is required to understand whether there are actually enduring cognitive benefits associated with repetition practises in Kenyan schools and whether there are other factors influencing repetition.

Class Size

There was modest evidence from Kenya to support existing literature on the importance of smaller classes (Case and Deaton 1999; Krueger 2003; Murnane and Levy 1996). The effects remained even after accounting for a number of school characteristics that are traditionally associated with class size gains. A realistic evaluation of these findings is absolutely essential because achieving smaller classes is such a costly undertaking. A close inspection of the results revealed that the benefits paled somewhat in comparison to the costs that would have to be incurred to implement this reform. Some would argue that even subtle class size effects of this kind are worth pursuing (Krueger 2003). Given chronic material shortages in African primary schools, it would be prudent to consider whether funds could be better spent elsewhere (Januszka and Dixon-Krauss 2008; Lockheed and Hanushek 1988; Rivkin et al. 2005).

Patterns of class size effects in Kenya and Tanzania were not identical. The relationship between class size and achievement was less clear in Tanzania. The analysis from Tanzania suggested that very small classes may not be beneficial to achievement (Michaelowa 2001; Willms and Somers 2001). Including details about classroom organisation might help to clarify the relationship between class size and achievement and the collection of such data should be considered in the future. Overcrowded classes are known to encourage rote style teaching, which is already widely used (Pontecraft and Hardman 2005). Detailed information on teaching practices within different class environments would help to unpack the interplay between class size and academic achievement. It would also be useful to investigate whether moderate class sizes are being maintained by increasing the number of school shifts and therefore reducing instructional time (Lockheed and Verspoor 1991). Though encouraging, without a randomised study it is difficult to draw any firm conclusions about whether there are enduring benefits of reducing class size in the two East African countries where distinct patterns emerged; but at the very least, these results suggested that a further enquiry would be worthwhile.

School Resources

It was quite informative that the association between school facilities and achievement appeared in Uganda. Recent efforts to expand access to primary education had resulted in specific policies to increase resource availability among schools in poor communities. One of these policies was the School Facilities Grant which provided resource poor schools with funds to expand facilities using local contractors and materials (Penny et al. 2007). That educational resources were important ingredients for academic achievement was

clearly established. How much of a differences resources made was another matter altogether. In truth, compared to the social background of the school there were considerably weaker links between material resources and academic achievement.

A further result of interest in this study was related to the detrimental effect of extensive teacher workloads on academic performance, especially among socially disadvantaged groups. Teachers in Uganda were not adequately prepared for the UPE reforms. Apart from schools where PTAs supplemented teacher salaries, many teachers found themselves with increased workloads and unadjusted salaries. To attract and retain the best candidates into the profession, it would be valuable to consider the short-run effects of education reform on the daily realities of teaching (Sawada and Ragatz 2005). Parents have been known to respond to the chaotic conditions brought about by mass education by seeking preferential treatment for their children, especially if parents have some local prominence (Alubisia 2005; Rajani 2001). It is difficult to prevent this kind of behaviour if working conditions for teachers are desperate. It is worthwhile exploring what alternative measures can be used in light of these findings. Training an adequate number of teachers is a lengthy process even under normal conditions. Certainly, decision makers need to consider ways of increasing teaching incentives. Ensuring that teacher salaries are competitive and are received in a timely manner are two possible ways of raising motivational levels. However critics of incentive programs have reported that their benefits can be short-lived and that they may encourage student drop-out (Glewwe et al. 2003). It remains a challenge to develop sustainable programmes that do not compound existing inequalities (Vegas and Umansky 2005).

The Organisational Climate of Schools

There is some evidence of negative effects on academic achievement that were related to attendance and behavioural problems and positive effects associated with community inputs. The academic climate can be disturbingly hostile for students in some East African schools. As one author describes, students "…risk being beaten, kicked, slapped, thrown against the wall, and otherwise humiliated for the smallest infraction or merely as a matter of course" (Rajani 2001, p.60). In Kenya and Tanzania, the relationship between attendance and behavioural problems and lower achievement supports existing literature related to school climate and poor educational performance in East Africa (Chapman 1994; Hungi 2005).

There is a close link between the climate of discipline in the school and the motivation of teachers within the school. Recent work has begun to suggest that the dismal working conditions of teachers in developing countries may have far reaching effects (VSO 2002). In interviews with 100 Tanzanian teachers and head teachers, Davidson found astonishingly low levels of morale that were attributed to poor living and working conditions. Teachers also felt that the status of teaching had declined dramatically over time (Davidson 2007). It is hardly surprising that lack of motivation among teachers who are working in poorly equipped and overcrowded schools should be linked to low achievement. The reality is that teachers will be held responsible for poor educational outcomes, thus lowering their status in the community even further.

Improving attendance and school discipline requires the co-operation not only of students, teachers and school leadership, but of parents and the wider community where the school is situated. Behavioural disturbances are closely linked to wider issues of discipline and once again require school leadership to interface tactfully with parents – not always a practical or culturally acceptable exercise. Problems of drug and alcohol abuse are often rooted in communities and require community solutions if they are to be kept out of schools (Entwisle et al. 1997).

6.2.4 Are there equal opportunities to learn for boys and girls in East African primary schools?

Studies show that pass rates for girls lag behind those for boys across the East African region and that differences are most acute in mathematics (Githua and Mwangi 2003; Rajani 2001). A worrying trend emerged regarding school effects and the gender gap in East Africa. First, very few school effects that influenced the gender gap could be identified. Second, for the school effects that were important, the general pattern was that characteristics of schools that raised academic achievement also tended to widen the gender gap. This is an important finding because it raises questions about whether the climate of schooling is somehow tailored to serve male students. How this can occur is quite obvious in some ways. For example, it is known that gendered themes exist in many African student textbooks. Learning material tends to depict boys in power roles and girls in more passive roles and generally reinforces gender stereotypes about student potential, especially in subjects such as mathematics (Lockheed and Verspoor 1991; Rajani 2001).

The problem of sexual harassment of female students by male teachers is widespread in developing countries (Mungai 2002; Odaga and Heneveld 1995) and in some extreme

instances, coercion into sexual activity is routine (Rajani 2001). Girls who resist the advances of male teachers may be punished. It has also been reported that where resources such as desks and learning materials are scarce and students compete for them on a daily basis, girls are no match for their male peers (Abagi and Odipo 1997). Parental involvement in student learning may be applied differently for sons and daughters. For example, if parental support translates to more time for studying while at home for both boys and girls then benefits could be similar; but if girls are still required to perform more chores while at home then the benefits of parental interest could be compromised (Peasgood et al. 1997).

The pattern of findings about school effects and gender also raises concerns about student attitude towards their subject matter. The literature has long suggested that the organisation of learning may favour boys and shape attitudes of both boys and girls towards a subject (Peterson and Fennema 1985), but this effect could not be captured with available measures of school organisation. Other East African research supports the need to understand mathematics self-concept better. In a study of Kenyan secondary schools, Githua and Mwangi (2003) established strong links between student self-concept towards mathematics and levels of achievement. Interestingly, boys showed healthier attitudes towards mathematics than girls. Lockheed and Vespoor made an important comment about the climate of teaching in developing countries. They noted that in some schools, girls rarely asked questions and were frequently overlooked by teachers (Lockheed and Verspoor 1991). Recent studies in Tanzania support these findings. It was reported that more attention was devoted to boys in Tanzanian schools and girls were given fewer opportunities to ask questions. Were they to make a mistake, teachers were known to publicly humiliate girls (Rajani 2001). Other researchers have confirmed that teachers in Tanzanian schools believed that boys were more naturally inclined to mathematics and science subjects and were therefore easier to teach (Colclough et al. 2003; Peasgood et al. 1997). Evidence from elsewhere in the region echoes these views. Mensch and Lloyd (1998) found that female teachers actually preferred teaching boys and considered that maths was more important for boys than for girls. All of these factors contribute to subtle differences in the way girls perceive themselves and what they aspire to become.

It is also known that gender differences in schooling may be related to religious traditions in some parts of sub-Saharan Africa (Odaga and Heneveld 1995). In areas where strong Islamic traditions prevail, early marriage is common and girls are removed from school when they reach puberty because parents fear they may become pregnant. However

the relationship between religious beliefs and the gender gap in achievement is often confounded by poverty and geographical location (Odaga and Heneveld 1995). Remote rural settings that are steeped in poverty are perhaps more likely to subject girls to this treatment than thriving urban centres. It is hardly surprising then that the geographical location of the school proved to be important for the gender gap in Tanzania because traditional practices are likely to be stronger in remote areas. Tanzania is also the poorest of the three countries and the urban setting could be capturing an added lifestyle advantage, as well as more progressive attitudes about girls in school.

Some research has shown that there is an important link between initiation ceremonies in Tanzania and the level of interest in school. Such ceremonies are used to introduce girls to their duties as wives and mothers when they reach puberty (Colclough et al 2003). Girls are known to lose interest in school after they have undergone initiation rites because they have been conditioned to assume adult roles and find it difficult to relate to their uninitiated peers (Odaga and Heneveld 1995). Initiation rites are also linked to absenteeism because they can be scheduled during the school period and last for several weeks[28]. Female students are also expected to perform chores within the school environment, such as cooking and cleaning, which only serves to reinforce gender stereotypes both in their minds and in the minds of their male peers (Rajani 2001).

In Kenya the gender composition of the school was found to be related to gender differences in achievement. Some authors have suggested that boys perform better in co-educational environments and girls excel in school climates that are predominantly female (Jimenez and Lockheed 1989; Lee and Lockheed 1998; Lee et al. 1994). Other studies have suggested that single-sex learning environments contribute very little to the educational experience of either group (Gray and Wilson 2006). It has been suggested that co-educational schools provide single-sex classrooms as an option for students (Hughes 2006-2007; Spielhagen 2006). It remains to be seen whether such an arrangement is feasible. Great care must be taken in interpreting the nature of this effect in this thesis. The characteristics that were of interest were those that benefited girls without any compensatory loss to boys. In this case, no significant gains were made for girls but instead the average achievement of boys fell as the concentration of females in the school increased. Therefore equity was achieved at the expense of an advantaged group, rather than through gains of the other, which was not a sought-after outcome.

The nature of the gender differences in mathematics has also been found to fluctuate across countries in the developed world with comparable economic backgrounds, as well

as other parts of the developing world, such as Latin America. Koblitz (1996) has pointed out that the proportion of female mathematicians in the United Kingdom and Northern Europe is vastly different to the United States, Southern, and Eastern Europe. This is a reminder that this phenomenon is not unique to the developing world. Nor is it confined to a period of time, because the gender gap has been found to widen and narrow within the same country during different periods.

In an interesting discussion of trends in mathematics-based gender differences, Baker and LeTendre (2005) attributed successful efforts at narrowing gender gaps to a recognition of the economic value of a labour force that included women scientists. Following this reasoning, it would appear that as developing countries advance economically and demands for an educated workforce increase, then educational opportunities will expand across gender lines. Even these researchers acknowledge that the pace of change will be influenced by cultural contingencies that are specific to different parts of the world. There is surely something to be said for the relationship between national indicators of progress and the quality of education, but ultimately a host of complex factors will drive gender differences in achievement in particular contexts. To have found that the school environment consistently reinforces gender biases across a region is, in itself, an important contribution.

6.2.5 Who benefited from free primary education in Uganda?

If the measure of success of UPE in Uganda was an increase in access to primary schooling among previously marginalised groups, then this reform appears to have been somewhat successful. In this part of the study I was primarily interested in the capacity to deliver quality education to primary school age students and especially those who were socially disadvantaged. In this regard there was certainly room for improvement. There was encouraging evidence relating to the distribution of physical and teaching resources but I have shown that social stratification in schools remained a serious concern. Free education in the Ugandan context was quite narrowly defined. It reduced the economic burden of tuition payments but replaced it with other costs that, for families with limited disposable income, were tantamount to making very difficult choices about daily life. The extreme outlook about the case of Uganda would be that 'almost' free education was actually worse than previous tuition-based arrangements. Proponents of this view would argue that rather than eliminating the direct and indirect costs of schooling, UPE in effect added to these

burdens for the very poor by merely re-distributing costs into PTA fees, uniforms, meal requirements, transport expenses and loss of household labour support.

Countries that fund their education systems through decentralised mechanisms are known to experience stronger effects of socioeconomic status on achievement than countries with centralised administrative structures. Evidence from Uganda in this thesis, where local government responsibilities had increased, certainly supports this view. Inefficiencies in localised administration strengthened the influence of local elites. Poorer parents also became more vulnerable and their children more likely to be marginalised. That the analysis isolated indirect effects between student social composition and resource availability in a school should hardly be surprising because parental status in the community was likely to influence resource distribution.

It could easily be argued that the greatest beneficiaries of free education were students from middle class homes, children from families who could not yet afford the costs of private schools but who could now channel the savings from fee waivers into private educational gains. Lockheed and Vespoor have argued that in the context of developing countries, equity in educational outcomes "…implies that all students are provided with educational experiences that ensure the achievement of uniform goals" (Lockheed and Verspoor 1991, p.145). Achieving this objective requires creative policies that directly take into account academic disadvantages faced by specific groups of students. The School Facilities Grant in Uganda is a good example of this type of policy because it targeted infrastructure constraints in poor schools and required local input to apply for funding.

Some researchers have proposed more aggressive strategies to increase local educational revenues such as matching grants. Funds raised through community contributions are matched by government grants using a formula that ensures that poorer communities receive grants at a higher ratio to wealthier ones. Matching grants have been successful in areas where traditions of community participation are strong and active and where institutional arrangements are available to provide technical support for less organised communities. Without this support, such funding mechanisms tend to be heavily biased against poor communities (Alubisia 2005). Other initiatives need to consider how to reduce the direct costs of schooling for the poor even further. At the very least, allowances for meal subsidies, stationery and uniforms for children from impoverished homes should be considered so that children are fit to benefit from instruction while at school (Fiske and Ladd 2004). Local governments need to co-operate with PTAs to improve service delivery to poor students, especially in terms of feeding programmes. If such direct costs are

ignored, then the removal of tuition fees becomes meaningless. In the long run, enrolment gains among poor children will erode (Lockheed and Verspoor 1991).

One of the proposals tabled during the planning stage of UPE in Uganda was a phased implementation of the reform. The idea was to introduce free education for the first five grades of primary school by 2000. In fact, initially UPE was restricted to four children per household. Perhaps a more tempered approach would have allowed for better planning and more intensive resource distribution. However political pressure led to more ambitious initiatives. Penny et al (2007, p.4) sum it up perfectly when they write:

> Education reform is a political process rather than a purely technical one. Politics makes a difference. It is not possible to separate technical education reforms from the wider governance environment required to make them work and the political system in which they are embedded.

There are lessons to be learned for other countries embarking on equally bold policy reforms. Most fundamentally, the study of Uganda put forward a case for a more measured approach towards mass education. If schools are to reverse social inequality among students rather than reinforce it, serious attention must be given to a further removal of other prohibitive costs. There is also a comprehensive argument in favour of improving administrative efficiency between local authorities and schools so that private interests are less likely to dominate the management of school affairs. Ultimately, it is "…the children of the poorest that must endure the inadequacies of the UPE system or else leave school" (Alubisia 2005, p.58).

6.3 School Effectiveness Research: Future Dilemmas

School effectiveness research is not without its critics. One frequently cited criticism is that it does not address deficiencies in other related sectors of the national education system (Scheerens 2000). Researchers who maintain this view argue that there is "no blueprint for a model school that can be reproduced and handed to policy makers" (Hanushek 1995, p.243) and not even expanding the nature and sophistication of school effectiveness research will allow a full explanation of the variation between schools in terms of achievement. Therefore the best means by which school quality can be guaranteed

is through the privatisation of the education system and the introduction of competition and performance incentives.

The obvious flaw in such a strategy is that the introduction of so-called incentive structures has proven to be acutely detrimental to students from deprived backgrounds (Diamond 2007; West and Pennell 2002). Standards-based reforms in the United States that reward schools based on the performance of students has led to sharp increases in drop-out among low-income students. There are reports of students being forced into remedial programmes to avoid tarnishing mainstream test scores (Darling-Hammond 2007). In fact, the strength of school effectiveness research tradition is that it focuses on the many different layers within the school and how they collectively contribute to successful academic outcomes "...rather than on a specific aspect of curriculum or instructional strategies, or school organization" (Lockheed and Levin 1993, p.5). Local conditions will of course mean that the specifics may differ from country to country but I take the view that these differences enrich our understanding of how schools operate in various contexts.

This thesis has highlighted some important issues to be considered in future studies. Perhaps one of the most pertinent observations about school effectiveness studies is that the repeated use of cross-sectional data to capture the effects of schooling has led to a mismatch between educational policies and estimates of educational quality. Education systems are constantly being defined and refined even in countries that perform well (Baker and LeTendre 2005). Lockheed and Verspoor (1991, p.219) point out that "…the central lesson learned from three decades of research on school reform in both industrial and developing countries is that educational change is a complex, dynamic, lengthy, and idiosyncratic process that proceeds in incremental steps." The cost of collecting longitudinal data needs to be weighed against the benefits of understanding whether investments in education are really bearing fruit.

Weaknesses in questionnaire design also need correcting in the future. One limitation of the SACMEQ survey was that there were no questions about student attitudes towards mathematics. Student attitudes have been strongly linked to academic achievement in East Africa (Githua and Mwangi 2003; Heyneman 1979; Lockheed and Verspoor 1991). A valuable addition to future study design would be questions that enable existing attitude scales to be tested (Adams 1984; Fennema and Sherman 1977; Keeves and Kotte 1992). Given the findings on gender inequality, future studies should consider collecting information on additional tasks and responsibilities that students undertake outside of

school. Additional information on the causes of grade repetition would also be worth considering to assist in the understanding different causes of this phenomenon. It would also be useful to determine whether the climate of learning is different for academically weak students through further information on classroom instruction.

Indicators of socioeconomic status were consistently related to educational achievement. In fact this was the single most consistent finding of the entire study. Whether family background was modelled at the individual level or whether it was transformed to represent the average social background of the school, it was associated with significant increases in academic achievement. Although this finding is less amenable to policy than the other school effects results, it does require serious attention because the implications are theoretically important for future school effectiveness research. The educational literature has long argued that the explanatory strength of school inputs was greater than that of family inputs in developing countries (Heyneman and Loxley 1983). This study supports emerging empirical analysis that the importance of family resources is increasing in relative terms and especially in countries where access to schooling is increasing (Baker et al. 2005). As free education expands across Africa, attention to issues of social stratification that have plagued education systems elsewhere will need to be addressed.

There is at present a renewed focus on the educational needs of underserved communities and the right of every student to a high quality education. One of the practical challenges facing African education ministries is the level of external involvement in decisions about school reform. Many African countries now depend heavily on multilateral agencies for financing primary school reform. In as much as commitment to free quality education is conditional, sustainability is not guaranteed. To move beyond the reform rhetoric, developments in education can no longer be at the mercy of either external agencies, local politicians or subject to ethnic affiliation. This is more likely in an environment where civic groups and communities continue to insist that all children be educated and educated well. What is encouraging is that the primary school sector has survived numerous disruptions, which is an indicator of the enduring faith of communities in the value of education.

6.4 Summary

The final chapter has provided a summary of the contents and findings of the thesis as a whole. It began by restating the three main objectives of the study and how they were

addressed within each chapter. The key findings of the thesis were discussed and policy implications were emphasised wherever possible. Addressing issues from an international perspective proved to be useful but needed to be done systematically. What has been consistently demonstrated in this study is that characteristics of schools matter and matter differentially. Much remains to be done if educational opportunities are to be sustained and meaningful in African schools. Indeed future school effectiveness research could benefit from certain modifications but its role in guiding policy is unquestionable. The chapter ended by proposing improvements for future studies of this kind. The recommendations centred on both conceptual and methodological adjustments. In the world of African educational policy, striving for excellence in primary schooling and creating systems where children from deprived backgrounds are not abandoned are held up as noble but unattainable goals. This thesis has demonstrated that with thought, innovation and persistence, these goals may be within reach after all.

NOTES

[1] Grisay and Griffin (2006) mention several international studies that are not strictly speaking comparative because either the sampling procedures or the data collection methods were not standardised across countries. These include UNESCO's and UNICEF's Monitoring Learning Achievement (MLA) studies, the World Bank's Assessing Basic Competencies (ABC) studies, the Programme d'analyse des systèmes éducatifs (PASEC) carried out by the Conférence des ministres de l'Éducation des pays francophones and the Latin America Laboratory for Assessment of the Quality of Education (LLCE). An International Assessment of Educational Progress that ran briefly in the 1980s but proved unpopular because it relied too heavily on American assessment programmes.

[2] Makerere University in Uganda

[3] An earlier version of the East African Community was established on 6th June 1967 but collapsed in 1977. Its failure has been attributed to political differences among the leaders (especially when Idi Amin came to power in Uganda) and to incompatible views on economic development (Arnold 2005). Kenya, Tanzania and Uganda re-established a new economic community in 1999. Additional members now include Rwanda and Burundi.

[4] Harambee means 'let us pull together' in Kiswahili.

[5] Measured by the number of years required for a student to complete the primary school cycle.

[6] Although Zanzibar forms part of the United Republic of Tanzania, education issues are administered independently of the mainland. In this thesis, I use data from the mainland of Tanzania.

[7] Uganda was one of the first countries to take advantage of the Heavily Indebted Poor Country (HIPC) debt initiative. Under this scheme, debt burdens of the world's poorest countries were reduced and extra resources were used to target poverty alleviation programmes. Uganda's strategy focused on improving primary health care and expanding access to primary education.

[8] The Human Development Index (HDI) is a composite index that contains measures of longevity, knowledge and the standard of living in a country.

[9] Although it is less common in the literature, in some communities the out-of-school responsibilities may actually be reversed. Fuller et al. (1994) showed that in Botswana, the pressure on boys to earn wages from an early age and to participate in such time-honoured traditions as looking after cattle meant that girls actually had more free time out of school. This is not the case in most developing countries, including those in this study.

[10] The first SACMEQ project took place in August of 1995. Seven countries took part in the initial study.

[11] Members of the SACMEQ Consortium are: Botswana, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, Tanzania (Mainland), Tanzania (Zanzibar), Uganda, Zambia and Zimbabwe. Although Zanzibar

forms part of the United Republic of Tanzania, education issues are administered independently of the mainland.

[12] Note that education regions do not necessarily correspond with conventional regional categories. This is because some regions are grouped together for the administration of education policy.

[13] Kenya is the only one of the three countries here that took part in both waves of SACMEQ.

[14] Zanzibar and Mozambique administered their surveys in Kiswahili and Portuguese respectively.

[15]In their investigation, Kreft and de Leeuw (1988) established that since the within school covariance was greater than the total covariance, the coefficient within and between classes had different signs.

[16] For a detailed description of the shrinkage estimator, refer to Chapter 3 of Raudenbush and Bryk (2002).

[17] I used academic support in the cross-country analysis of gender-equity because of interest in the influence of attitudes about school on the gender achievement gap. It was not a focal point in Uganda's research of social inequality and I did not include it at either level of that model.

[18] Very few schools were dropped because the overwhelming majority of schools were co-educational. Less than 3 per cent of schools in Kenya were omitted, less than 1 per cent in Tanzania and none in Uganda.

[19] Though an official policy of automatic promotion was in place in Uganda, research suggests that it was not strictly followed (World Bank 2002).

[20] Urban schools were classified as those that were situated in large towns or cities. Non-urban schools were either in small towns, isolated or rural areas.

[21] A very minor class size effect was detected in Uganda during the early stages of the analysis but this was entirely explained by the school location variable. The implication was that that larger classes were an urban phenomenon in Uganda unlike in Kenya and Tanzania where the effects persisted even when other school effects were included in the model. For this reason, class size effects were not pursued in Uganda.

[22] I tested for the relationship between different resource effects and the gender gap, including gender-related resources such as toilet facilities in schools. I found no notable effects from these measures. What seemed to make a difference were estimates of general availability of facilities within a school. There was also no information about gender-based teaching attitudes in this data. I tested for effects of the gender of teachers and school principals but found no meaningful effects.

[23] Enrolment figures for the period prior to the introduction of UPE are very inconsistent. The more conservative official estimates indicated that primary enrolments remained

stagnant for the decade prior to UPE but independent estimates have suggested that enrolments began to increase slowly in 1991 and then accelerated in 1997 (Reinikka, 2001).

[24] The DHS Ed Survey Asset Index was based on ownership of the following items: radio, television, refrigerator, telephone, bicycle, motorcycle/scooter, car/truck, boat/canoe, donkey or plot of land. It also used information on source of lighting, water, fuel and type of sanitation facilities. Materials used for the floor, wall and roof a house were also included. Asset scores were normalized, standardized and divided into quintiles.

[25] Household items included: bed, newspaper, bicycle, radio, clock, motorcar or lorry, camera, and television.

[26] Unlike mathematics, where gender-based achievement differences between schools were significant, I found no evidence that the gender gap in reading achievement varied significantly between Ugandan primary schools.

[27] Approximately 90 per cent of primary school students attend government owned schools.

[28] Male initiation practises and circumcision rituals are also common across East Africa but they are less likely to detract from interest in school. If anything, they reinforce perceptions of the dominant role than men play in society and instil ideas about the inherent male advantage in technical aspects of life (Odaga and Heneveld 1995).

APPENDIXES

Appendix 3.1: Description of Variables Used in the Multilevel Analysis

In this appendix, I present additional details about the variables that were used in the HLM analysis. In addition to a description of each student and school-level variable, I also indicate the name of the variable as it appears on the original SACMEQ dataset in parentheses [ ].

Student-level Variables

Mathematics Achievement: A mathematics test score for Grade 6 students. The test consisted of 63 questions in total of which 27 questions covered numeric ability, 18 questions tested measurement and 18 questions assessed spatial ability. It was standardised to a SACMEQ mean of 500 and standard deviation of 100 [ZMALOCP].

Reading Achievement: A reading test score for Grade 6 students. The test consisted of 83 questions in total of which 32 questions covered narrative ability, 26 questions tested the expository domain and 25 questions were allocated to document domain. It was standardised to a SACMEQ mean of 500 and standard deviation of 100 [ZRALOCP].

Socioeconomic Status: In constructing the ses index, three separate dimensions were created and then combined to represent the parental education level (ZPFAMOED), household assets (ZPTOTP12) and the physical quality of the house (ZPHMQUAL). Parental education was a likert-type item coded from 1 (no school) to 6 (post-secondary and tertiary education). The variable ZPFAMOED was created by adding the individual values for mother's and father's education. ZPTOTP12 was constructed by adding a series of dichotomous items that described the possessions found in a student's home. The items included in this dimension were: newspaper, magazine, radio, tv, vcr, cassette player, telephone, car, running water, electricity and a table. The physical quality of the house was based on four variables. Each variable had four possible responses. The variables were: source of lighting (ranging from fire to electricity), the wall material (ranging from 'not sealed' to 'cut stone or brick'), the floor material (ranging from 'not sealed' to 'carpet or tiles') and the roof material (ranging from 'not sealed' to 'tiles'). The variable ZPHMQUAL was derived by adding the four values together. The final ses measure (ZPSES) was derived by adding and recoding the values for ZPFAMOED ZPTOTP12 and ZPHMQUAL within each country. I standardised the variable within each country, mean (M)=0, standard deviation (SD)=1

Female: A dummy-coded variable for student gender. It was coded '1' for female and '0' for male [ZPSEX].

Academic Support Outside of School: A composite measure for the extent of academic support that a student received outside of school. It comprised information on whether a student had someone to make sure their homework was done, whether a student could ask for help from someone at home, whether a student was expected to practice reading and mathematical tasks for someone at home, whether anyone asked students questions about what they were learning at school, and whether anyone looked at work completed while at school [ZPHMINT].

Grade Repetition: A dummy-coded variable for whether a student had repeated a grade. It was coded '1' if the student had repeated a grade at least once and '0' otherwise [ZPREPEAT].

Weighting variable: The student-level weight was proportional to the reciprocal of the probability of inclusion in the survey sample. The sampling weight adjusted for missing data and for differences in selection probabilities due to the multistage sampling design [PWEIGHT2].

School-level Variables

Average SES: School-level aggregate of Grade 6 student socioeconomic status. I standardised the variable within each country, mean (M)=0, standard deviation (SD)=1.

Percentage Repetition: School-level aggregate of the prevalence of repetition among Grade 6 students. I standardised the variable within each country, mean (M)=0, standard deviation (SD)=1.

Class Size: I based this variable on information from Grade 6 mathematics teachers on the number of students in the Grade 6 mathematics class. In schools where there was more than one Grade 6 mathematics class, an average was taken [YCLSIZE].

Urban School Location: A dummy-coded variable coded '1' for large town or city and '0' otherwise [SLOCAT].

School Sector: A dummy-coded variable coded '1' for government schools and '0' for private schools [STYPE].

Percentage Female: The gender composition of Grade 6 students. It was the school-level aggregate of the Grade 6 student gender variable. I standardised the variable within each country, mean (M)=0, standard deviation (SD)=1.

School Resources: A composite measure of school physical resources consisted of information on the availability of the following school facilities: library, hall, staff room, office for the school head, store room, sports ground, garden, fence and cafeteria. I standardised the variable within each country, mean (M)=0, standard deviation (SD)=1 [SRES01 SRES02 SRES03 SRES04 SRES05 SRES07 SRES12 SRES22 SRES23].

Community Support for Student Meals: A dummy-coded variable based on a response from the school head on the presence of community support in preparing school meals. I coded the variable '1' if there was community support for this activity and '0' otherwise [SCOMM14].

Student Attendance Problems: I constructed the variable based on the school head report of students arriving late at school, students' unjustified absence, students skipping classes and students dropping out of school. There were three possible response categories for each variable – never, sometimes and often. Within each country, I aggregated and standardised a combination of the four variables, mean (M)=0, standard deviation (SD)=1. Higher values indicated higher levels of student attendance problems [SPUPPR01 SPUPPR02 SPUPPR03 SPUPPR04].

Teacher Behavioural Problems: I based the variable on information from the school head on intimidation or bullying of students by teachers, sexual harassment of teachers by other teachers, sexual harassment of students by teachers, use of abusive language by teachers, drug abuse by teachers, alcohol abuse or possession by teachers. There were three possible response categories for each variable – never, sometimes and often. Within each country, I aggregated all six variables and z-scored them, variables, mean (M)=0, standard deviation (SD)=1[STCHPR04 STCHPR05 STCHPR06 STCHPR07 STCHPR08 STCHPR09].

Community Support for School Resources: I constructed the variable based on the school head report of community help in supplying furniture and equipment, textbooks, stationery and other materials. Within each country, I aggregated all four variables and z-scored them, mean (M)=0, standard deviation (SD)=1[SCOMM03 SCOMM04 SCOMM05 SCOMM06].

Teacher Attendance Problems: I based this variable on the school head report of teachers arriving late, teacher absenteeism, and teachers skipping classes. There were three possible response categories for each variable – never, sometimes and often. Within each country, I aggregated and standardised all three variables, mean (M)=0, standard deviation (SD)=1 [STCHPR01 STCHPR02 STCHPR03].

Total Number of Hours of Teaching: This variable was used exclusively in the Uganda model of social inequality. It is an aggregated variable that represents the total number of hours spent teaching by reading teacher. [XMINUTES XPERIODS].

Appendix 3.2: Variance Decomposition for Mathematics Achievement Across SACMEQ

	Bot	Ken	Les	Mal	Mau	Moz	Nam	Sey	Sou	Swa	Tan	Uga	Zam	Zan
Maths Achievement	513.87	563.25	448.62	433.78	577.84	525.35	437.88	553.14	478.09	518.35	522.40	506.28	430.32	478.04
Average Within-School Sample Size	19.5	17.8	17.8	16.7	19.2	18.1	18.7	61.8	18.7	18.7	15.7	16.1	15.1	17.3
Total Variance Within Schools (sigma-squared)	5258.63	5253.82	2472.31	2720.48	14190.00	2634.81	3407.41	10663.75	4190.79	3287.06	5045.17	4258.99	4162.30	2666.29
Total Variance Between Schools (tau)	1493.16	2877.53	1059.85	475.83	4727.40	684.15	4180.30	1095.61	7184.03	1104.00	1919.48	7262.17	1067.05	1371.45
Intraclass Correlation (ICC)[a]	0.22	0.35	0.30	0.15	0.25	0.21	0.55	0.09	0.63	0.25	0.25	0.63	0.20	0.34
Reliability (lambda)	0.85	0.91	0.88		0.86	0.82	0.96	0.84	0.97	0.86	0.83	0.96	0.78	0.90
ICC= tau/(tau+sigma squared)														

Country Abbreviations: Bot=Botswana, Ken=Kenya, Les=Lesotho, Mal=Malawi, Mau=Mauritius, Moz=Mozambique, Nam=Namibia, Sey=Seychelles, Sou=South Africa, Swa=Swaziland, Tan=Tanzania, Uga=Uganda, Zam=Zambia, Zan=Zanzibar.

Appendix 3.3: Coefficients for Within-School HLM Models of Grade 6 Mathematics Achievement Across SACMEQ

	Bot	Ken	Les	Mal	Mau	Moz	Nam	Sey	Sou	Swa	Tan	Uga	Zam	Zan
Fixed Effect														
Intercept	512.86	575.60	448.61	438.79	575.03	533.30	440.47	535.89	478.08	521.13	533.57	512.29	436.47	483.65
	(2.89)[a]	(4.00)	(2.79)	(2.40)	(5.44)	(2.40)	(3.69)	(5.82)	(5.95)	(2.72)	(3.75)	(6.76)	(2.85)	(3.57)
Socioeconomic Status	16.27	17.80	3.48	7.69	36.78	3.01	13.89	25.44	15.36	5.85	17.02	6.48	14.43	6.40
	(2.02)	(1.91)	(1.11)	(1.55)	(3.11)	(1.10)	(1.77)	(4.46)	(2.20)	(1.67)	(1.97)	(1.84)	(1.95)	(1.73)
Female	2.05	-22.39	0.02	-10.19	7.86	-20.97	-4.36	35.39	0.62	-5.42	-29.51	-19.05	-11.12	-10.83
	(2.30)	(3.18)	(1.93)	(2.23)	(4.45)	(1.96)	(1.82)	(4.08)	(2.28)	(2.01)	(3.29)	(3.12)	(2.60)	(2.64)
Grade Repetition	-46.31	-19.14	-13.67	-9.02	-64.83	-9.00	-17.97	-8.63	-19.50	-22.43	-23.31	-11.93	-13.51	-13.75
	(2.31)	(2.80)	(1.82)	(2.68)	(5.38)	(2.20)	(2.12)	(9.64)	(2.80)	(2.25)	(3.86)	(3.10)	(2.79)	(2.57)
Academic Support	-3.05	-1.16	-2.48	-0.71	3.96	-2.05	-3.72	16.42	-4.90	-2.78	7.97	-1.04	0.23	-0.60
	(1.46)	(1.68)	(1.02)	(1.33)	(3.16)	(0.94)	(0.94)	(4.99)	(1.53)	(1.14)	(1.58)	(1.57)	(1.63)	(1.23)
Random Effects														
Variance in School														
Mean Achievement	1094.10	2379.89	1043.74	389.66	2965.10	708.24	3031.21	651.65	5589.13	939.04	1878.97	6880.48	784.52	1319.75
Rij	4680.50	4791.68	2426.93	2669.75	12569.96	2512.05	3304.45	9453.11	4037.08	3166.72	4682.04	4032.45	4040.53	2588.67
Reliability														
Mean Achievement	0.82	0.89	0.88	0.70	0.81	0.83	0.94	0.78	0.96	0.85	0.78	0.96	0.73	0.89

a. Standard errors are shown in parentheses below coefficient estimates.

Appendix 3.4: Coefficients for Between-School HLM Models of Grade 6 Mathematics Achievement Across SACMEQ

	Bot	Ken	Les	Mal	Mau	Moz	Nam	Sey	Sou	Swa	Tan	Uga	Zam	Zan
School Composition														
Average Social	5.91	13.38	-0.36	3.44	8.28	6.86	23.90	-2.03	15.65	11.60	13.99	27.56	-0.31	-10.12
Background	(4.20)[a]	(6.10)	(3.87)	(3.34)	(6.44)	(3.09)	(4.19)	(10.23)	(6.31)	(3.27)	(4.21)	(8.79)	(3.97)	(4.70)
	1.75	12.61	-1.02	-3.47	-11.97	4.85	-7.99	7.34	-20.52	-3.91	0.04	-10.80	-0.71	-2.16
% Repetition	(2.76)	(4.62)	(2.56)	(1.99)	(10.58)	(1.99)	(2.41)	(8.57)	(5.31)	(3.03)	(3.36)	(6.77)	(2.86)	(2.95)
% Academic Support	3.70	11.44	1.97	0.26	-2.82	-1.19	-4.67	6.66	-6.10	-0.48	7.04	-14.96	7.82	-4.44
	(3.63)	(3.69)	(2.31)	(2.17)	(4.22)	(2.14)	(2.62)	(6.36)	(4.38)	(2.45)	(3.32)	(7.34)	(3.11)	(3.69)
Average Age Grade 6	8.80	-11.20	-1.60	9.80	-5.88	-5.72	9.81	-11.40	3.55	-2.28	1.40	-8.00	-5.56	0.51
	(3.89)	(5.22)	(2.58)	(2.88)	(10.60)	(3.22)	(2.84)	(7.92)	(4.53)	(3.62)	(3.24)	(7.22)	(4.67)	(3.65)
	-1.54	-4.42	0.68	-1.78	-1.68	-3.72	-2.99	-28.59	7.73	-1.91	3.68	-2.94	-5.19	-7.25
% Female	(2.16)	(3.38)	(2.65)	(1.63)	(4.26)	(2.82)	(2.40)	(10.96)	(3.84)	(2.54)	(3.11)	(7.66)	(3.10)	(2.62)
School Structure														
Class Size	-4.23	-7.87	3.19	3.71	12.09	-5.68	1.95	4.41	-4.22	-2.08	-6.23	-3.02	3.42	6.39
	(3.07)	(3.38)	(2.95)	(1.83)	(5.80)	(2.03)	(2.23)	(5.98)	(4.23)	(2.93)	(3.07)	(4.99)	(2.76)	(3.52)
Urbanicity	6.17	2.21	35.09	11.63	-6.98	2.22	18.90	-1.93	22.12	-13.33	-14.25	-22.78	-1.78	7.61
	(4.23)	(10.83)	(11.50)	(7.08)	(10.87)	(5.84)	(8.47)	(14.80)	(11.93)	(7.34)	(8.24)	(15.73)	(6.18)	(6.73)
Sector	-94.61	-7.71	4.55	-2.22	-11.02	-4.21	-22.43	-124.64	24.76	-9.09		-5.18	-30.68	-123.22
	(26.77)	(16.46)	(4.87)	(9.12)	(10.04)	(9.35)	(21.11)	(49.69)	(11.26)	(9.63)	N/A[c]	(37.79)	(22.23)	(27.91)
Resources	3.91	2.16	3.07	2.59	-0.95	-2.65	11.18	13.73	18.12	1.63	-0.98	11.54	4.17	-1.03
	(2.36)	(3.74)	(2.31)	(1.94)	(4.35)	(2.10)	(2.57)	(10.26)	(4.88)	(2.96)	(2.55)	(6.51)	(2.85)	(3.07)
School Resources														
Teaching Resources	2.52	-3.50	-3.11	-3.74	5.40	-1.61	3.93	18.58	2.48	2.28	0.30	-4.75	-0.42	-3.82
	(2.20)	(3.79)	(2.39)	(1.81)	(3.95)	(2.60)	(2.29)	(6.43)	(4.43)	(2.17)	(2.94)	(7.06)	(2.61)	(2.40)
Teacher Quality	2.24	-3.41	2.80	2.50		4.22	10.93	3.65		6.41	2.99	9.43	1.52	6.41
	(2.82)	(3.28)	(3.01)	(2.00)	N/A[b]	(2.31)	(2.76)	(6.20)	N/A[b]	(2.50)	(2.82)	(7.55)	(2.51)	(3.14)
School Organisation														
Community Support	-3.79	17.77	-4.70	3.11	-17.61	9.36	-3.15	8.65	9.12	3.27	-10.50	9.97	9.27	4.05
for Pupil Meals	(5.29)	(7.94)	(6.14)	(25.54)	(12.69)	(7.76)	(6.29)	(19.47)	(9.71)	(4.87)	(6.91)	(12.33)	(7.21)	(12.67)
Teacher Behavioural	-1.33	0.65	-3.11	-0.20	-0.23	3.72	2.21	-9.31	2.89	0.16	-7.30	-4.76	2.47	-4.92
Problems	(2.66)	(6.06)	(2.41)	(2.02)	(4.42)	(2.02)	(2.39)	(7.54)	(4.95)	(2.88)	(3.42)	(9.14)	(2.97)	(1.97)
Teacher Attendance	-1.47	-11.15	-4.85	-0.66	-8.38	-2.95	-9.86	10.38	-10.54	0.06	3.16	14.34	-2.36	2.31
Problems	(3.02)	(3.39)	(2.61)	(1.78)	(4.85)	(2.31)	(2.43)	(8.77)	(5.59)	(2.81)	(3.68)	(9.65)	(2.79)	(2.23)
Reliability	0.73	0.85	0.86	0.68	0.77	0.80	0.87	0.56	0.92	0.85	0.76	0.95	0.71	0.87

a. Standard errors are shown in parentheses below coefficient estimates.
b. Teacher testing was not carried out in Mauritius and South Africa. c. All schools in the Tanzanian sample were government schools.

Appendix 4.1: Class Size Effects in Kenya and Tanzania

	Kenya	Tanzania
Intercept (Average Achievement)	575.93***	544.47***
Measures of School Composition		
Average Social Background	12.63*	12.95**
Percentage Repetition	14.11**	-
Percentage Female	-9.58*	-
Percentage Academic Support	12.14**	11.09**
Average Age of Grade 6 Students	-12.14*	2.39
Measures of School Structure[a]		
Class Size 0 to 25 Students	40.49**	-26.92*
Class Size 26 to 35 Students	5.48	0.59
Class Size 41 to 45 Students	-6.13	-6.42
Class Size 46 and above	-0.72	-18.63*
Urban School Location	5.66	-19.30~
Sector	-12.34	NA
Measures of Resources		
Teacher Quality	-3.13	2.80
Teaching Resources	-3.22	-0.26
Measures of School Social Organization		
Community Support for Pupil Meals	17.98*	-
Teacher Behavioral Problems	-	-5.92*
Teacher Attendance Problems	-10.47**	-
Gender Achievement Gap (a)		
Measures of School Composition	-18.17**	-31.74***
Percentage Female	11.83**	-
Percentage Academic Support	-	-8.62**
Measures of School Structure[a]	-	-
School Location	-	27.57*
Class Size 0 to 25 Students	-18.94~	9.91
Class Size 26 to 35 Students	-6.99	-5.82
Class Size 41 to 45 Students	1.75	-2.72
Class Size 46 and above	-3.93	1.60

Random Effects	**Variance Components**	
Intercept, $\mu 0j$	1788.88***	1620.55***
Gender slope, $\mu 1j$	636.51***	662.46***
Level-1 error, rij ($\sigma 2$)	4800.94	4673.46

a. The reference category was average class size ranging from 36 to 40.

REFERENCES

Abagi, O. 1994. "Educational Reform in Kenya with Reference to the Current 8-4-4 System of Education." in *Southern African Comparative and History of Education Society 4th Annual Conference*. Botswana.

Abagi, O. and G. Odipo. 1997. "Efficiency of Primary Education in Kenya: Situational Analysis and Implications for Educational Reform." *Institute of Policy Analysis and Research* Discussion Paper No. 004/97.

Acana, S., D. Kyagaba, and A. Opaman. 2003. "The Achievements of Primary School Pupils in Uganda in English Literacy and Numeracy." Uganda National Examinations Board, Kampala.

Adams, R.J. 1984. "Sex Bias in ASAT?" ACER, Hawthorn.

Akerkielm, K. 1995. "Does Class Size Matter?" *Economics of Education Review* 14:229-241.

Alderman, H., J.R. Behrman, D.R. Ross, and R. Sabot. 1996. "Decomposing the Gender gap in Cognitive Skills in a Poor Rural Economy." *The Journal of Human Resources* 31:229-254.

Alubisia, A.A. 2005. "UPE Myth or Reality? A review of experiences, challenges and lessons from East Africa." OXFAM/ANCEFA, London.

Amutabi, M.N. 2003. "Political interference in the running of education in post-independence Kenya: a critical retrospection." *International Journal of Educational Development* 23:127-144.

Anderson, L.W., D.W. Ryan, and B.J. Shapiro. 1989. "The IEA Classroom Environment Study." Pergamon Press, Oxford.

Angrist, J.D. and V. Lavy. 1999. "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement." *The Quarterly Journal of Economics* 114:533-575.

Appleton, S. 2001. "What Can We Expect from Universal Primary Education?" in *Uganda's Recovery: The Role of Farms, Firms and Government*, edited by R. Reinikka and P. Collier. Washington D.C.: World Bank.

Arnold, G. 2005. *Africa. A Modern History*. London: Atlantic Books.

Baker, D.P., B. Goesling, and G.K. LeTendre. 2002. "Socioeconomic Status, School Quality, and National Economic Development: A Cross-National Analysis of the "Heyneman-Loxley Effect" on Mathematics and Science Achievement." *Comparative Education Review* 46:291-312.

—. 2005. "Socioeconomic Status, School Quality, and National Economic Development: A Cross-National Analysis of the "Heyneman-Loxely Effect" on Mathematics and Science Achievement." *Comparative Education Review* 46:291-312.

Baker, D.P. and D.P. Jones. 1993. "Creating Gender Equality: Cross-national Gender Stratification and Mathematical Performance." *Sociology of Education* 66:91-103.

Baker, D.P. and G.K. LeTendre. 2005. *National Differences, Global Similarities. World Culture and the Future of Schooling*, Edited by D. P. Baker and G. K. LeTendre. Stanford: Stanford University Press.

Balli, S.J., D.H. Demo, and J.F. Wedman. 1998. "Family Involvement with Children's Homework: An Intervention in the Middle Grades." *Family Relations* 47:149-157.

Barr, R. and R. Dreeben. 1983. *How Schools Work*. Chicago: The University of Chicago Press.

Bendera, S. 1998. "Does a Gender Problem Exist in Primary Education in Tanzania?" in *Gender and Education in Tanzanian Schools*, edited by S. J. Bendera and M. W. Mboya. Dar es Salaam: Women Education Development Group.

Bhorat, H. 2004. "The Development Challenge in Post-Apartheid South Africa." in *Changing Class. Education and Social Change in Post-Apartheid South Africa*, edited by L. Chisholm. Cape Town: HSRC Press.
Bidwell, C. 1965. "The school as a formal organization." in *The Handbook of Organizations*, edited by J. G. March. Chicago, Illinois: Rand McNally.
Biggs, J. 1998. "Learning from the Confucian heritage: so size doesn't matter?" *International Journal of Educational Research* 29:723-738.
Blossfeld, H.P. and Y. Shavit. 1993. "Persisting Barriers - Changes in Educational Opportunities in Thirteen Countries." in *Persistant Inequality - Changing Educational Attainment in Thirteen Countries*, edited by Y. Shavit and H. P. Blossfeld. Westview Press: Boulder, Colorado.
Bogonko, S.N. 1992. *Reflections on Education in East Africa*. Nairobi: Oxford University Press.
Boissiere, M. 2004. "Determinants of Primary Education Outcomes in Developing Countries." World Bank, Washington D.C.
Bosker, R. 1998. "The class size question in primary schools: policy issues, theory, and empirical findings from the Netherlands." *International Journal of Educational Research* 29:763-778.
Boyd, W.L. 1983. "Rethinking educational policy management: Political science and educational administration in the 1980s." *American Journal of Education* 1:1-29.
Bradshaw, Y.W. and B. Fuller. 1996. "Policy Action and School Demand in Kenya." *International Journal of Comparative Sociology* 37:72-96.
Bray, M. 1996. *Decentralization of Education - Community Financing*. Washington, D.C.: World Bank.
Brett, E.A. 1996. "Uganda - 1987-94." in *Limits of Adjustment in Africa - The Effects of Economic Liberalization 1986-94*, edited by P. Engberg-Pederson, P. Gibbon, P. Raikes, and L. Udsholt. Oxford, New Hampshire: James Currey Ltd, Heinnemann.
Brophy, J. 2006. *Grade Repetition*. Paris: IIEP.
Bryk, A.S. and V.E. Lee. 1992. "Are politics the problems and markets the answer? An essay review of "Politics, markets, and America's schools."" *Economics of Education Review* 11:439-451.
Bryk, A.S., V.E. Lee, and P.B. Holland. 1993. *Catholic Schools and the Common Good*. Cambridge, MA: Harvard University Press.
Bryk, A.S. and S.W. Raudenbush. 1992. *Hierarchical Linear Models*. Newbury Park, California: Sage.
Buchert, L. 1994. *Education in the Development of Tanzania: 1919-1990*. London, Dar es Salaam, Athens: James Currey, Mkuki na Nyota, Ohio University Press.
Buchmann, C. 1999. "The State and Schooling in Kenya: Historical Developments and Current Challenges." *Africa Today* 46:95-117.
—. 2000. "Measuring Family Background in International Studies of Education: Conceptual Issues and Methodological Challenges." in *Methodological Advances in Cross-National Surveys of Educational Achievement*, edited by A. C. Porter and A. Gamoran. Washington D.C.: National Academy Press.
—. 2001. "Education and Stratification in Developing Countries: A Review of Theories and Research." *Annual Review of Sociology* 27:77-102.
Burstein, L. 1980. "The Analysis of Multilevel Data in Educational Research and Evaluation." *Review of Research in Education* 8:158-233.
Burstein, L., K.B. Fischer, and M.D. Miller. 1980. "The Multilevel Effects of Background on Science Achievement: A Cross-National Comparison." *Sociology of Education* 53:215-225.

Byamugisha, A. and F. Ssenabulya. 2005. "The SACMEQ II Project in Uganda: A Study of the Conditions of Schooling and the Quality of Education." SACMEQ, Ministry of Education and Sports, Harare, Kampala.
Caldwell, J.C. 1986. "Routes to Low Mortality in Poor Countries." *Population Development Review* 12:177-220.
Cameron, L. 2005. "Primary Completion Rates." Education Policy and Data Center Technical Paper WP-09-01, Washington D.C.
Case, A. and A. Deaton. 1999. "School Inputs and Educational Outcomes in South Africa." *Quarterly Journal of Economics* 114:1047-1084.
Chabbott, C. and E.J. Elliot. 2003. *Understanding Others, Educating Ourselves: Getting More from International Comparative Studies in Education*. Washington D.C.: National Academic Press.
Chapman, D.W. 1994. *Reducing Teacher Absenteeism and Attrition: Causes, Consequences and Responses*. Paris: IIEP.
Chen, C. and H.W. Stevenson. 1989. "Homework: A Cross-Cultural Examination." *Child Development* 60:551-561.
Chesswas, J.D. 1966. *Educational Planning and Development in Uganda*. Paris: IIEP.
Chisholm, L., U. Hoadley, M. wa Kivulu, H. Brookes, C. Prinsloo, A. Kgobe, D. Mosia, H. Narsee, and S. Rule. 2005. "Educator Workload in South Africa." HSRC, Cape Town.
Chubb, J. and T. Moe. 1990. *Politics, Markets and America's Schools*. Washington, DC: Brookings Institution.
Cohn, E. and R. Rossimiller. 1987. "Research on Effective Schools: Implications for Less Developed Countries." *Comparative Education Review* 31:377-399.
Colclough, C., S. Al-Sammarrai, P. Rose, and M. Tembon. 2003. *Achieving Schooling for All in Africa - Costs, Committment and Gender*. Burlington: Ashgate.
Coleman, J.S., E. Campbell, C. Hobson, J. McPartland, J. Mood, F. Weinfeld, and R. York. 1966. "Equality of Educational Opportunity." US Government Printing Office, Washington, DC.
Coleman, J.S. and T. Hoffer. 1987. *Public and Private High Schools: The Impact of Communities*. New York: Basic Books.
Coleman, J.S., T. Hoffer, and S. Kilgore. 1982. *High School Achievement: Public, Catholic, and Private Schools Compared*. New York: Basic Books.
Commonwealth Secretarit. 2005. "Report of a Consultation on the Recruitment and Migration of the Highly Skilled (Nurses and Teachers)." Social Transformation Programmes Division, London.
Cronbach, L.J. 1976. "Research on classrooms and schools: Formulations of questions designs and analysis." Occasional paper of the Stanford Evaluation Consortium, Stanford University, Stanford, California.
Cross, A.R., W. Obungu, and P. Kizito. 1991. "Evidence of a Transition to Lower Fertility in Kenya." *International Family Planning Perspectives* 17:4-7.
Currie, J. 1997. "Family Background, Academic Achievement and Occupational Status in Uganda." *Comparative Education Review* 21:14-28.
Curtis, S., I. Diamond, and J.W. McDonald. 1993. "Birth Interval and Family Effects on Postneonatal Mortality in Brazil." *Demography* 30:33-43.
Darling-Hammond, L. 1999. "Teacher Quality and Student Achievement: A Review of State Policy Evidence." University of Washington, Seattle.
—. 2007. "The Flat Earth and Education: How America's Commitment to Equity Will Determine Our Future." *Educational Researcher* 36:318-334.

Darling-Hammond, L., J. Ancess, and S. Ort. 2002. "Reinventing High School: Outcomes of the Coalition Campus Schools Project." *American Educational Research Journal* 39:639-673.
Darmawan, I.G.N. and J.P. Keeves. 2006. "Suppressor Variables and Multilevel Mixture Modelling." *International Education Journal* 7:161-174.
Dauda, C. 2004. "The Importance of De Facto Decentralization in Primary Education in Sub-Saharan Africa - PTAs and Local Accountability in Uganda." *Journal of Planning Education and Research* 24.
Davidson, E. 2007. "The Pivotal Role of Teacher Motivation in Tanzanian Education." *The Educational Forum* 71:157-166.
de Leeuw, J. and G.G. Kreft. 1995. "Questioning Multilevel Models." *Journal of Educational and Behavioural Statistics* 20:171-189.
Deininger, K. 2003. "Does cost of schooling affect enrollment by the poor? Universal primary education in Uganda." *Economics of Education Review* 22:291-305.
Diamond, J.B. 2007. "Where the Rubber Meets the Road: Rethinking the Connection Between High-Stakes Testing Policy and Classroom Instruction." *Sociology of Education* 80:285-313.
Dreeben, R. 2006. "Structural Effects in Education - A History of an Idea." in *Handbook of the Sociology of Education*, edited by M. T. E. Hallinan. New York: Springer.
Dreeben, R. and R. Barr. 1987. "An Organizational Analysis of Curriculum and Instruction." in *The Social Organization of Schools - New Conceptualizations of the Learning Process*, edited by M. T. Hallinan. New York: Plenum Press.
Duncan, W.A. 1989. *Engendering School Learning*. Stockholm: Institute of International Education.
Duthilleul , Y. and R. Allen. 2005. "What Teachers Make a Difference? Implications for Policy Makers in SACMEQ Countries." in *SACMEQ International Invitational Conference*. Paris: IIEP.
Dweck, C. 1986. "Motivational Processes Affecting Learning." *American Psychologist* 41:1040-1048.
Edmonds, R. 1979. "Effective Schools for the Urban Poor." *Educational Leadership* 37:15-24.
Eisemon, T.O. and J. Schwille. 1991. "Primary Schooling in Burundi and Kenya: Preparation for Secondary Education or for Self-Employment?" *The Elementary School Journal* 92:23-39.
Elley, W.B. 1992. "How in the World Do Students Read? IEA Study of Reading Literacy." International Association for the Evaluation of Education Achievement, The Hague.
Entwisle, D.R., K.L. Alexander, and L.S. Olson. 1997. *Children, Schools, & Inequality*. Boulder, Co: Westview Press.
Eshiwani, G.S. 1990. "Implementing Educational Policies in Kenya." World Bank, Washington D.C.
Fägerlind, I and L.J. Saha. 1989. *Education and National Development: A Comparative Perspective*. Oxford: Pergamon Press.
Felson, R.B. and L. Trudeau. 1991. "Gender Differences in Mathematics Performance." *Social Psychology Quarterly* 54:113-126.
Fennema, E. and J. Sherman. 1977. "Sex-Related Differences in Mathematics Achievement, Spatial Visualization and Affective Factors." *American Educational Research Journal* 14:51-71.
—. 1978. "Sex-Related Differences in Mathematics Achievement and Related Factors: A Further Study." *Journal for Research in Mathematics Education* 9:189-203.

Fennema, E. and L.A. Tartre. 1985. "The Use of Spatial Visualization in Mathematics by Girls and Boys." *Journal for Research in Mathematics Education* 16:184-206.
Filmer, D. and L. Pritchett. 1999. "The Effect of Household Wealth on Education Attainment: Evidence from 35 countries." *Population and Development Review* 25:85-120.
Finn, J.D. and C.M. Achilles. 1990. "Answers and Questions about Class Size: A Statewide Experiment." *American Educational Research Journal* 27:557-577.
Fiske, E.B. and H.F. Ladd. 2004. *Elusive Equity. Education Reform in Post-Apartheid South Africa*. Washington D.C.: Brookings.
Fogelman, K. 1978. "School attendance, attainment and behaviour." *British Journal of Educational Psychology* 48:148-58.
Forum for African Women Educationalists. 2006. "Critical Characteristics of Effective Primary Education in the Rwenzori Region of Uganda: A Study of 30 Schools in 5 Districts of Uganda." in *ADEA Binnale on Education in Africa*. Libreville: ADEA.
Foy, P. and M. Joncas. 1999. "TIMSS Sample Design." in *TIMSS 1999 Technical Report*, edited by M. Martin, K. Gregory, and S. E. Stemler. Boston: Boston College.
Fredrick, W.C. 1980. "Instructional Time." *Evaluation in Education* 4:117-118.
Friedman, L. 1989. "Mathematics and the Gender Gap: A Meta-Analysis of Recent Studies on Sex Differences in Mathematical Tasks." *Review of Educational Research* 59:185-213.
Fuller, B. 1986. "Is Primary School Quality Eroding in the Third World?" *Comparative Education Review* 30:491-507.
—. 1987. "What School Factors Raise Achievement in the Third World?" *Review of Educational Research* 57:255-292.
—. 1998. "Quality of Education in Developing Nations: Policies for Improving." in *Education: The Complete Encyclopedia*, edited by T. Husen, T. N. Postlethwaite, B. R. Clark, and G. Neave: Pergamon.
Fuller, B. and P. Clarke. 1994. "Raising School Effects while Ignoring Culture? Local Conditions and the Influence of Classroom Tools, Rules, and Pedagogy." *Review of Educational Research* 64:119-157.
Fuller, B., L. Dellagnelo, A. Strath, E.S.B. Bastos, M.H. Maia, K.S.L. De Matos, A.L. Porterla, and S.L. Viera. 1999. "How to Raise Children's Early Literacy? The Influence of Family, Teacher, and Classroom in Northeast Brazil." *Comparative Education Review* 43:1-35.
Fuller, B., H. Hua, and C.W. Snyder. 1994. "When Girls Learn More than Boys: The Influence of Time in School and Pedagogy in Botswana." *Comparative Education Review* 38:347-376.
Fuller, B., J. Singer, and M. Keiley. 1995. "Why do Daughters Leave School in Southern Africa? Family Economy and Mothers' Commitments." *Social Forces* 74:657-681.
Galabawa, C.J. 1990. "Implementing Educational Policies in Tanzania." World Bank, Washington D.C.
Galton, M. 1998. "Class size: a critical comment on the research." *International Journal of Educational Research* 29:809-818.
Gatheru, R.M. 2005. *Kenya: From Colonization to Independence, 1888-1970*. Jefferson, North Carolina, London: Mcfarland.
Githua, B.N. and J.G. Mwangi. 2003. "Students' mathematics self-concept and motivation to learn mathematics: relationship and gender differences among Kenya's secondary-school students in Nairobi and Rift Valley provinces." *International Journal of Educational Development* 23:487-499.
Glass, G.V. and D.A. Matthews. 1991. "Are data enough." *Educational Researcher* 20:24-27.

Glass, G.V. and M.L. Smith. 1978. "Metal-Analysis of Research on the Relationship of Class Size and Achievement." Far West Laboratory for Educational Research and Development, San Francisco, California.
Glewwe, P., N. Ilias, and M. Kremer. 2003. "Teacher Incentives." *National Bureau of Economic Research* Working Paper 9671.
Glewwe, P., M. Kremer, and S. Moulin. 1998. "Textbooks and Test Scores: Evidence from a Prospective Evaluation in Kenya." World Bank, Washington D.C.
Gomes-Neto, J.B. and E. Hanushek. 1994. "Causes and Consequences of Grade Repetition: Evidence from Brazil." *Economic Development and Cultural Change* 43:117-148.
Gordon, A., D. Nkwe, and M. Graven. 1998. "Gender and Education in Rural South Africa." in *Women and Education in sub-Saharan Africa - Power, Opportunities, and Constraints*, edited by M. Bloch, J. A. Beoku-Betts, and B. R. Tabachnick. London: Lynne Rienner.
Government of Uganda. 1999. "The Ugandan Experience of Universal Primary Education (UPE)." Ministry of Education and Sports, Kampala.
—. 2000. "Education Statistical Abstract 2000." Ministry of Education and Sports, Kampala.
—. 2005. "Status of Education for Rural People in Uganda." in *Education for Rural People in Africa: Policy Lessons, Options and Priorities*. Addis Ababa: FAO/UNESCO/ADEA.
Gray, C. and J. Wilson. 2006. "Teachers' experiences of a single-sex initiative in a co-education school." *Educational Studies* 32:285-298.
Gray, M. 1996. "Gender and Mathematics: Mythology and Misogyny." in *Towards Gender Equity in Mathematics Education*, edited by G. Hanna. Dordrecht, Boston, London: Kluwer Academic Publishers.
Grisay, A. and P. Griffin. 2006. "What are the main cross-national studies." in *Cross-national studies of the quality of education - Planning their design and managing their impact*, edited by D. R. Ross and I. J. Genevois. Paris: UNESCO.
Gundlach, E. and L. Wößmann. 2001. "The fading productivity of schooling in Asia." *Journal of Asian Economics* 12:401-417.
Haddad, W. 1979. "Educational and Economic Effects of Promotion and Repetition Practices." *World Bank Staff Working Paper* No. 319.
Haller, E., D. Monk, A. Bear, J. Griffith, and P. Moss. 1990. "School Size and Program Comprehensiveness: Evidence from High School and Beyond." *Educational Evaluation and Policy Analysis* 12:109-120.
Hallinan, M.T (Ed). 1987. "The Social Organization of Schools - An Overview." in *The Social Organization of Schools - New Conceptualizations of the Learning Process*, edited by M. T. E. Hallinan. New York: Plenum Press.
Hanna, G. 1989. "Mathematics Achievement of Girls and Boys in Grade Eight: Results from Twenty Countries." *Educational Studies in Mathematics* 20:225-232.
Hanushek, E. 1995. "Interpreting Recent Research on Schooling in Developing Countries." *The World Bank Research Observer* 10:227-46.
Hanushek, E. and L. Wößmann. 2007. "The Role of School Improvement in Economic Development." *National Bureau of Economic Research* Working Paper 12832.
Hanushek, E.A. 1986. "The Economics of Schooling: Production and Efficiency in Public Schools." *Journal of Economic Literature* 24:1141-1177.
—. 1996. "School Resources and Student Performance." in *Does Money Matter? The Effect of School Resources on Student Achievement and Adult Success*, edited by G. Burtless. Washington, D.C.: Brookings Institution Press.

—. 1999. "Some Findings from an Independent Investigation of the Tennessee STAR Experiment and from Other Investigations of Class Size Effects." *Educational Evaluation and Policy Analysis* 21:143-163.
Hanushek, E.A. and J. Luque. 2002. "Efficiency and Equity in Schools Around the World." National Bureau of Economic Research Working Paper 8949, Cambridge, Massachesetts.
Hanushek, E.A., S.G. Rivkin, and L.L. Taylor. 1996. "Aggregation and the Estimated Effects of School Resources." *The Review of Economics and Statistics* 78:611-627.
Harbinson, F. and C. Myers. 1964. *Education, manpower, and economic growth*. New York: McGraw-Hill.
Hauser, R. 1970. "Educational Stratification in the United States." *Sociological Inquiry* 40:102-129.
Heck, R.H. and S.L. Thomas. 2000. *An Introduction to Multilevel Modeling*: Lawrence Erlbaum Associates Inc.
Hedges, L.V. and R. Greenwald. 1996. "Have Times Changed? The Relation between School Resources and Student Performance." in *Does Money Matter? The Effect of School Resources on Student Achievement and Adult Success*, edited by G. Burtless. Washington D.C.: Brookings Institution Press.
Hedges, L.V., R.D. Laine, and R. Greenwald. 1994. "Does Money Matter? A Meta-Analysis of Studies of the Effects of Differential School Inpus on Student Outcomes." *Educational Reseacher* 23:5-14.
Heyneman, S.P. 1975. "Changes in Efficiency and in Equity Accruing from Government Involvement in Ugandan Primary Education." *African Studies Review* 18:51-60.
—. 1976a. "A Brief Note on the Relationship between Socioeconomic Status and Test Performance among Ugandan Primary School Children." *Comparative Education Review* 20:42-47.
—. 1976b. "Influences on Academic Achievement: A Comparison of Results from Uganda and More Industrialized Societies." *Sociology of Education* 49:200-211.
—. 1977. "Differences in Construction, Facilities, Equipment and Academic Achievement among Ugandan Primary Schools." *International Review of Education* 23:35-46.
—. 1979. "Why Impoverished Children Do Well in Ugandan Schools." *Comparative Education* 15:175-185.
—. 1983. "Education during a Period of Austerity: Uganda, 1971-1981." *Comparative Education Review* 27:403-413.
—. 1999. "The sad story of UNESCO's education statistics." *International Journal of Educational Development* 19:65-74.
—. 2003. "International education quality." *Economics of Education Review* 23:441-452.
—. 2005. "Student Background and Student Achievement: What Is the Right Question." *American Journal of Education* 112:1-9.
Heyneman, S.P., J.P. Farrel, and M.A. Sepulveda-Stuardo. 1981. "Textbooks and Achievement in Developing Countries: What We Know." *Journal of Curriculum Studies* 13:227-246.
Heyneman, S.P. and D.T. Jamison. 1980. "Student Learning in Uganda: Textbook Availability and Other Factors." *Comparative Education Review* 24:206-220.
Heyneman, S.P. and W. Loxley. 1983. "The Effect of Primary-School Quality on Academic Achievement Across Twenty-nine High-and-Low-Income Countries." *The American Journal of Sociology* 8:1162-1194.
Hill, H. 2007. "Mathematical Knowledge of Middle School Teachers: Implication for the No Child Left Behind Policy Initiative." *Educational Evaluation and Policy Analysis* 29:95-114.

Hobcraft, J., J.W. McDonald, and S.O. Rutstein. 1985. "Demographic Determinants of Infant and Early Childhood Mortality." *Population Studies* 39:657-687.
Hong, G. and Y. Bing. 2007. "Early-Grade Retention and Children's Reading and Math Learning in Elementary Years." *Educational Evaluation and Policy Analysis* 29:239-261.
Hox, J. 2002. *Multilevel Analysis. Techniques and Applications*. Mahwah, New Jersey: Lawrence Erlbaum Associates.
Hoxby, C.M. 2000. "The Effects of Class Size on Student Achievement: New Evidence from Population Variation." *Quarterly Journal of Economics*.
Hoy, W.K., C.J. Tarter, and A.W. Hoy. 2006. "Academic Optimism of Schools: A Force for Student Achievement." *American Educational Research Journal* 43:425-446.
Hughes, T.A. 2006-2007. "The Advantages of Single-Sex Education." *National Forum of Educational Administration and Supervision Journal* 23:5-14.
Hungi, N. 2005. "Modelling pupils' absenteeism: Emerging policy issues from SACMEQ projects." in *SACMEQ International Invitational Conference*. Paris: IIEP.
IMF. 2006. "United Republic of Tanzania: Poverty Reduction Strategy Paper." IMF.
Jackson, G.B. 1975. "The Research Evidence on the Effects of Grade Retention." *Review of Educational Research* 45:613-635.
Jamison, D.T., B. Searle, K. Galda, and S.P. Heyneman. 1981. "Improving Elementary Mathematics Education in Nicaragua: An Experimental Study of the Impact of Textbooks and Radio on Achievement." *Journal of Educational Psychology* 73:556.
Januszka, C. and L. Dixon-Krauss. 2008. "A Battle between Accountability and Quality Instruction." *Childhood Education* 84:167-70.
Jimenez, E. and M.E. Lockheed. 1989. "Enhancing Girls' Learning Through Single-Sex Education: Evidence and a Policy Conundrum." *Educational Evaluation and Policy Analysis* 11:117-142.
Jimenez, E. and V. Paqueo. 1996. "Do Local Contributions Affect the Efficiency of Public Primary Schools?" *Economics of Education Review* 15:377-386.
Jin, L. and M. Cortazzi. 1998. "Dimensions of dialogue: large classes in China." *International Journal of Educational Research* 29:739-761.
Jürges, H. and K. Schneider. 2004. "International Differences in Student Achievement: An Economic Perspective." *German Economic Review* 5:357-380.
Kanogo, T. 2005. *African Womanhood in Colonial Kenya 1900-50*. Oxford, Nairobi, Athens: James Currey, EAEP, Ohio University Press.
Keeves, J.P. and D. Kotte. 1992. "Disparities between the sexes in science education: 1970-1984." in *The IEA Study of Science III. Changes in Science Education and Achievement: 1970-1984*, edited by J. P. Keeves. Oxford: Pergamon Press.
Keeves, J.P. and N. Sellin. 1990. "Some Problems of Analysis." *International Journal of Educational Research* 14:219-223.
Kennedy, E. and G. Mandeville. 2000. "Some Methodological Issues in School Effectiveness Research." in *The International Handbook of School Effectiveness Research*, edited by C. Teddlie and D. Reynolds. London and New York: Routledge, Falmer.
Kikampikaho, M. and J.C. Kwesiga. 2002. "Contributions of Women's Organisations to Girls' Education in Uganda." in *The Women's Movement in Uganda - History, Challenges, and Prospects*, edited by A. M. Tripp and J. C. Kwesiga. Kampala: Fountain Publishers.
Kish, L. 1965. *Survey Sampling*. New York - London - Sydney: John Wiley & Sons.
Kishor. 2000. "Empowerment of Women in Egypt and Links to the Survival and Health of Their Infants." in *Women's Empowerment and Demographic Processes - Moving Beyond Cairo*, edited by H. Presser and G. Sen. Oxford: Oxford University Press.

Kizito, P. 1998. "Understanding the Determinants of Under Five Mortality in Kenya." Department of Social Stastistics, Unpublished Doctoral Thesis, University of Southampton.
Knapp, T.R. 1977. "The Unit-of-Analysis Problem in Applications of Simple Correlation Analysis to Educational Research." *Journal of Educational Statistics* 2:171-186.
Koblitz, A.H. 1996. "Mathematics and Gender: Some Cross-Cultural Observations." in *Towards Gender Equity in Mathematics Education - An ICMI Study*, vol. 3, edited by G. Hanna. Dordrecht, Boston, London: Kluwer Academic Publishers.
Kohn, M.L. 1987. "Cross-National Research as an Analytic Strategy: American Sociological Association, 1987 Presidential Address." *American Sociological Review* 52:713-731.
Korostoff, M. 1998. "Tackling California's Class Size Reduction Policy Initiative: An Up Close and Personal Account of How Teachers and Learners Responded." *International Journal of Educational Research* 29:797-807.
Kreft, G.G. and E.D. de Leeuw. 1988. "The See-Saw Effect: a multilevel problem?" *Quality and Quantity* 22:127-137.
Krueger, A.B. 1999. "Experimental Estimates of Education Production Functions." *The Quarterly Journal of Economics* 114:497-532.
—. 2003. "Economic Considerations and Class Size." *The Economic Journal* 113:F34-F63.
Le Grand, J. 1990. "Equity Versus Efficiency: The Elusive Trade-Off." *Ethics* 100:554-568.
Leder, G.C. 1982. "Mathematics achievement and fear of success." *Journal for Research in Mathematics Education* 13:124-135.
Lee, J. and J. Barro. 1997. "Schooling Quality in a Cross Section of Countries." National Bureau of Economic Research, Cambridge, Massachusetts.
Lee, V.E. 2001. *Restructuring High Schools for Equity and Excellence - What Works*, Edited by G. Natriello. New York: Teachers College Press.
Lee, V.E. and A.S. Bryk. 1986. "Effects of Single-Sex Secondary Schools on Student Achievement and Attitudes." *Journal of Educational Psychology* 78:381-395.
—. 1989. "A Multilevel Model of the Social Distribution of High School Achievement." *Sociology of Education* 62:172-192.
Lee, V.E., A.S. Bryk, and J.B. Smith. 1993. "The organization of effective secondary schools." Pp. 171-267 in *Review of Research in Education*, vol. 19, edited by L. Darling-Hammond. Washington, D.C.: American Educational Research Association.
Lee, V.E. and D.T. Burkam. 2003. "Dropping out of High School: The Role of School Organization and Structure." *American Educational Research Journal* 40:353-393.
Lee, V.E. and M.E. Lockheed. 1998. "Single-Sex Schooling and Its Effects on Nigerian Adolescents." in *Women and Education in Sub-Saharan Africa - Power, Opportunities, and Constraints*, edited by M. Bloch, J. A. Beoku-Betts, and B. R. Tabachnick. London: Lynner Rienner.
Lee, V.E., H.M. Marks, and T. Byrd. 1994. "Sexism in Single-Sex and Coeducational Independent Secondary Schools Classrooms." *Sociology of Education* 67:99-120.
Lee, V.E. and J.B. Smith. 1995. "Effects of High School Restructuring and Size on Early Gains in Achievement and Engagement." *Sociology of Education* 68:241-270.
—. 1997. "High School Size: Which Works Best and for Whom." *Educational Evaluation and Policy Analysis* 19:205-227.
Lee, V.E., J.B. Smith, and R.G. Croninger. 1997. "How High School Organization Influences the Equitable Distribution of Learning in Mathematics and Science." *Sociology of Education* 70:128-150.

Lee, V.E., T.L. Zuze, and K.R. Ross. 2005. "School Effectiveness in 14 Sub-Saharan African Countries: Links with 6th Graders' Reading Achievement." *Studies in Educational Evaluation* 31:207-246.
Levin, H.M. 1988. "Cost-Effectiveness and Educational Policy." *Educational Evaluation and Policy Analysis* 10:51-69.
Linn, M.C. and J.S. Hyde. 1989. "Gender, Mathematics, and Science." *Educational Researcher* 18:17-19+22-27.
Lockheed, M.E. 1993. "The Condition of Primary Education in Developing Countries." in *Effective Schools in Developing Countries*, edited by H. M. Levin and M. E. Lockheed. London, Washington D.C.: The Falmer Press.
Lockheed, M.E., J. Fonacier, and L.J. Bianchi. 1989a. "Effective Primary Level Science Teaching in the Philippines." World Bank Policy, Planning, and Research Working Papers - WPS 208, Washington, D.C.
Lockheed, M.E., B. Fuller, and R. Nyirongo. 1989b. "Family effects on students' achievement in Thailand and Malawi." *Sociology of Education* 62:239-256.
Lockheed, M.E. and E. Hanushek. 1988. "Improving Educational Efficiency in Developing Countries: What Do We Know?" *Compare* 18:21-38.
Lockheed, M.E. and H.M. Levin. 1993. "Creating Effective Schools." in *Effective Schools in Developing Countries*, edited by M. E. Lockheed and H. M. Levin. London/Washington D.C.: The Falmer Press.
Lockheed, M.E. and N.T. Longford. 1989. "A Multilevel Model of School Effectiveness in a Developing Country." *World Bank Discussion Papers* 69.
Lockheed, M.E., S.C. Vail, and B. Fuller. 1986. "How Textbooks Affect Achievement in Developing Countries: Evidence from Thailand." *Educational Evaluation and Policy Analysis* 8:379-392.
Lockheed, M.E. and A.M. Verspoor. 1991. *Improving Primary Education in Developing Countries*. Oxford: Oxford University Press.
Luke, D.A. 2004. *Multilevel Modeling*. Thousand Oaks, London, New Delhi: Sage Publications.
Maccoby, E.E. and C.N. Jacklin. 1974. *The Psychology of Sex Differences*. Stanford, California: Stanford University Press.
Mare, R.D. 1981. "Change and Stability in Educational Stratification." *American Sociological Review* 46:72-87.
Marks, G.N. 2008. "Accounting for Gender Gaps in Student Performance in Reading and Mathematics: Evidence from 31 Countries." *Oxford Review of Education* 34:89-109.
McCoy, A.R. 1998. "Grade Retention and School Performance: An Extended Investigation." *Institute for Research on Poverty* Discussion Paper no. 1167-98.
Mensch, B.S. and C.B. Lloyd. 1998. "Gender Differences in the Schooling Experiences of Adolescents in Low-Income Countries: The Case of Kenya." *Studies in Family Planning* 29:167-184.
Meuret, D. 2006. "Equity and efficiency of compulsory schooling: Is it necessary to choose and if so on what grounds?" *Prospects* 36:389-410.
Michaelowa, K. 2001. "Primary Education Quality in Francophone Sub-Saharan Africa: Determinants of Learning Achievement and Efficiency Considerations." *World Development* 29:1699-1716.
Mikiko, N., Y. Takashi, and Y. Sasaoka. 2008. "Impacts of the Universal Primary Education Policy on Educational Attainment and Private Costs in Rural Uganda." *International Journal of Educational Development* 28:161-171.

Mizala, A. and P. Romaguera. 2005. "Teachers' Salary Structure and Incentives in Chile." in *Incentives to Improve Teaching. Lessons from Latin America*, edited by E. Vegas. Washington D.C.: World Bank.
Mjagila, S. 1999. "National Report Second Draft Education for All: The 2000 Assessment." Government of Tanzania, Dar es Salaam.
Mlama, P. 2000. "Adolescent Sexuality and Pregnancy." *FAWE News*, July-September 2000.
Molnar, A., P. Smith, and J. Zahorik. 1999. "Evaluation Results of the Student Achievement Guarantee in Education (SAGE) Program, 1998-99." University of Wisconsin, Madison.
Mosha, H.J. 1988. "A Reassessment of the Indicators of Primary Education Quality in Developing Countries: Emerging Evidence from Tanzania." *International Review of Education* 34:17-45.
Mrutu, A.S., G.E. Ponera, and E.M. Nkumbi. 2005. "The SACMEQ II Project in Tanzania: A Study of the Conditions of Schooling and the Quality of Education." SACMEQ, Ministry of Education and Culture, Harare, Dar es Salaam.
Mugisha, F. 2006. "School enrollment among urban non-slum, slum and rural children in Kenya: Is urban advantage eroding?" *International Journal of Educational Development* 26:471-482.
Mukudi, E. 2004. "Education for all: a framework for addressing the persisting illusion for the Kenyan context." *International Journal of Educational Development* 24:231-240.
Mullens, J.E., R.J. Murnane, and J.B. Willett. 1996. "The Contribution of Training and Subject Matter Knowledge to Teaching Effectiveness: A Multilevel Analysis of Longitudional Evidence from Belize." *Comparative Education Review* 40:139-157.
Muller, C. 1998. "Gender Differences in Parental Involvement and Adolescents' Mathematics Achievement." *Sociology of Education* 71:336-356.
Mungai, A.M. 2002. *Growing up in Kenya: Rural Schooling and Girls. Rethinking Childhood.* New York: Peter Lang.
Murnane, R.J. and F. Levy. 1996. "Evidence from Fifteen Schools in Austin, Texas." in *Does Money Matter? The Effect of School Resources on Student Achievement and Adult Success*, edited by G. Burtless. Washington, D.C.: Brookings Institution Press.
Murnane, R.J. and B.R. Phillips. 1981. "What Do Effective Teachers of Inner-City Children Have in Common." *Social Science Research* 10:83-100.
Murphy, M. and W. Schulz. 2006. "Sampling for National Surveys in Education." Australian Council for Education Research, Melbourne.
Mushemeza, E.D. 2003. "Financial Management of Education in a Decentralized Setting: The Case of Uganda." in *CODESRIA - Working Group on Finance and Education*. Dakar.
Mwiria, K. 1990. "Kenya's Harambee Secondary School Movement: The Contradictions of Public Policy." *Comparative Education Review* 34:350-368.
Niles, F.S. 1981. "Social Class and Academic Achievement: A Third World Reinterpretation." *Comparative Education Review* 25:419-430.
Nishimura, Mikiko, Takashi Yamano, and Yuichi Sasaoka. 2007. "Impacts of the universal primary education policy on educational attainment and private costs in rural Uganda." *International Journal of Educational Development* In Press, Corrected Proof.
Nkumbi, E., L. Warioba, and W. Komba. 2006. "Capacity of Primary School Management for Professional Development in Selected Primary Schools in Tanzania." in *Africa-Asia Dialogue Seminar*, *10th March 2006*. Tokyo.

Nonoyama-Tarumi, Y. 2008. "Cross-National Estimates of the Effects of Family Background on Student Achievement: A Sensitivity Analysis." *International Review of Education* 54:57-82.
Nyagura, L.M. and A. Riddell. 1993. "Primary School Achievement in English and Mathematics in Zimbabwe: A Multi-Level Analysis." *World Bank Policy Research Paper* WPS-1208.
Nye, B., L.V. Hedges, and S. Konstantopoulos. 2000. "Do the Disadvantaged Benefit More from Small Classes? Evidence from the Tennessee Class Size Experiment." *American Journal of Education* 109:1-26.
—. 2001a. "Are Effects of Small Classes Cumulative? Evidence From a Tennessee Experiment." *Journal of Educational Research* 94:336-345.
—. 2001b. "The Long-Term Effects of Small Classes in Early Grades: Lasting Benefits in Mathematics Achievement at Grade 9." *Journal of Experimental Education* 69:245-257.
—. 2004. "Do minorities experience larger lasting benefits from smaller classes?" *Journal of Educational Research* 98:94.
Odaga, A. and W. Heneveld. 1995. "Girls and Schools in Sub-Saharan African." World Bank, Washington D.C.
Odden, A. 1987. "Education Reform and Services to Poor Children: Can the Two Policies be Compatible?" *Educational Evaluation and Policy Analysis* 9:231-244.
—. 1990. "Class size and student acheivement: Research based policy alternatives." *Educational Evaluation and Policy Analysis* 12:213-17.
OECD. 2001. *Knowledge and skills for life: First results from PISA 2000*. Paris: OECD.
Oketch, A. 2006. "Uganda Case Study for Literacy in Education for All 2005 - A Review of Policies, Strategies and Practices." UNESCO, Paris.
Oketch, M. and C. Rolleston. 2007. "Policies on Free Primary and Secondary Education in East Africa: Retrospect and Prospect." *Review of Research in Education* 31:131-158.
Onsomu, E., J. Nzomo, and C. Obiero. 2005. "The SACMEQ II Project in Kenya: A Study of the Conditions of Schooling and the Quality of Education." SACMEQ, MOEST, Harare, Nairobi.
Panel on Transitions to Adulthood in Developing Countries and National Research Council. 2005. "Schooling." in *Growing up Global: The Changing Transitions to Adulthood in Developing Countries*, edited by C. B. Lloyd. Washington D.C: National Academies Press.
Park, A. and E. Hannum. 2001. "Do Teachers Affect Learning in Developing Countries? Evidence from Matched Student-Teacher Data from China." in *Social Science Research Council Conference - Rethinking Social Science Research on the Developing World in the 21st Century*, edited by S. S. R. Council. Utah.
Parsons, J.E., C.M. Kaczala, and J.L. Meece. 1982. "Socialization of achievement attitudes and beliefs? Parental influences." *Child Development* 53:322-39.
Peaker, G.F. 1971. "The Plowden Children Four Years Later." National Foundation for Educational Research in England and Wales, London.
Peasgood, T., S.J. Bendera, N. Abrahams, and M. Kisanga. 1997. "Gender and Primary Schooling in Tanzania." Institute of Development Studies, Brighton.
Penny, Alan, Michael Ward, Tony Read, and Hazel Bines. 2007. "Education sector reform: The Ugandan experience." *International Journal of Educational Development* In Press, Corrected Proof.
Peterson, P.L. and E. Fennema. 1985. "Effective Teaching, Student Engagement in Classroom Activities, and Sex-Related Differences in Learning Mathematics." *American Educational Research Journal* 22:309-335.

Pontecraft, C. and F. Hardman. 2005. "The discourse of classroom interaction in Kenyan primary schools." *Comparative Education* 41:87-106.
Postlethwaite, T.N. 2006. "What is a 'good' cross-national study?" in *Cross-national studies of the quality of education - Planning their design and managing their impact*, edited by K. N. Ross and I. J. Genevois. Paris: UNESCO.
Postlethwaite, T.N. and K.R. Ross. 1992. "Effective Schools in Reading: Implications for Educational Planners. An Exploratory Study." International Association for the Evaluation of Educational Achievement, Hamburg.
Psacharopoulos, G. 1989. "Time trends of the returns to education: Cross-national evidence." *Economics of Education Review* 8:225-231.
Psacharopoulos, G. and H.A. Patrinos. 2004. "Returns to investment in education: a further update." *Education Economics* 12:111-134.
Purkey, S.C. and M.S. Smith. 1985. "School Reform: The District Policy Implications of the Effective Schools Literature." *The Elementary School Journal*:352-389.
Raikes, P. and P. Gibbon. 1996. "Tanzania 1986-94." in *Limits of Adjustment in Africa. The Effects of Economic Liberalization, 1986-94*, edited by P. Engberg-Pederson, P. Gibbon, P. Raikes, and L. Udsholt. Oxford, New Hampshire: James Currey Ltd, Heinemann.
Rajani, R. 2001. "Situation Analysis of Children in Tanzania." UNICEF, Dar es Salaam.
—. 2003. "Is Primary Education Heading in the Right Direction? Thinking with Nyerere." in *6th UDSM Convocation Symposium*. University of Dar Es Salaam.
Raju. 1973. *Education in Kenya - Problems and Perspectives in Educational Planning and Administration*. London: Heinemann.
Raudenbush, S. and A.S. Bryk. 1986. "A Hierarchical Model for Studying School Effects." *Sociology of Education* 59:1-17.
Raudenbush, S.W and C. Bhumirat. 1992. "The distribution of resources for primary education and its consequences for educational achievement in Thailand." *International Journal of Educational Research* 17:143-164.
Raudenbush, S.W and J. Kim. 2002. "Statistical Issues in Analysis of International Comparisons of Educational Achievement." in *Methodological Advances in Cross National Surveys of Educational Achievement*, edited by N. R. Council. Washington D.C.: National Academy Press.
Raudenbush, S.W. and A.S. Bryk. 2002. *Hierarchical Linear Models - Applications and Data Analysis Methods*. Thusand Oaks, London, New Delhi: Sage Publications.
Rawls, J. 1999. *A Theory of Justice*. Cambridge, MA: Harvard University Press.
Raywid, M.A. 1985. "Family choice arrangements in public schools: A review of literature." *Review of Educational Research* 55:435-67.
Ready, D.D. and V.E. Lee. 2006. "Optimal Elementary School Size for Effectiveness and Equity: Disentangling the Effects of Class Size and School Size." in *What Do We Know about the Effects of School Size and Class Size?* Washington, D.C.: Brookings Institute.
Reinikka, R. 2001. "Recovery of Service Delivery: Evidence from Schools and Health Centers." in *Uganda's Recovery: The Role of Farms, Firms and Government*, edited by R. Reinikka and P. Collier. Washington D.C.: World Bank.
Reynolds, D., C. Teddlie, B. Creemers, J. Scheerens, and T. Townsend. 2000. "An Introduction to School Effectiveness Research." in *The International Handbook of School Effectiveness Research*, edited by C. Teddlie and D. Reynolds. London and New York: Routhledge/Falmer.
Rice, J. 2003. *Teacher Quality: Understanding the Effectiveness of Teacher Attributes*. Washington D.C.: Economic Policy Institute.

Riddell, A. 1997. "Assessing Designs for School Effectiveness Research and School Improvement Studies." *Comparative Education Review* 41:178-204.
Rivkin, S.G., E.A. Hanushek, and J.F. Kain. 2005. "Teachers, Schools, and Academic Achievement." *Econometrica* 73:417-458.
Rockoff, J.E. 2004. "The Impact of Individual Teachers on Student Achievement: Evidence from Panel Data." *The American Economic Review* 94:247-252.
Ross, K.R. 2007. "Quality and equity in basic education: can we have both?" Pp. 9 in *IIEP Newsletter*. Paris.
Ross, K.R., M. Saito, S. Dolata, M. Ikeda, T.L. Zuze, S. Murimba, T.N. Postlethwaite, and P. Griffin. 2005. "Chapter 2: The Conduct of the SACMEQ II Project." in *The SACMEQ II Project in Kenya - A Study of the Conditions of Schooling and the Quality of Education*, edited by E. Onsomu, J. Nzomo, and C. Obiero. Harare: SACMEQ.
Ross, K.R. and T.L. Zuze. 2004. "Traditional and alternative views to school system performance." Pp. 8-9 in *IIEP Newsletter*. Paris.
Rubner, J. 2006. "How can a country manage the impact of 'poor' cross-national research results? (A case study from Germany)." in *Cross-national studies of the quality of education - Planning their design and managing their impact*, edited by K. N. Ross and I. J. Genevois. Paris: UNESCO.
SAPRIN. 2004. *Structural Adjustment - The Policy Roots of Economic Crisis, Poverty and Inequality*. London, New York: Zed Books.
Sawada, Y. and A. Ragatz. 2005. "Decentralization of Education, Teacher Behavior, and Outcomes. The Case of El Salvador's EDUCO Program." in *Incentives to Improve Teaching. Lessons from Latin America*, edited by E. Vegas. Washington D.C.: World Bank.
Scanlon, D. 1964. *Education in Uganda*. Washington: U.S. Department of Health, Education, and Welfare.
Schaefer, T.E. 1990. "One More Time: How Do You Get Both Equality and Excellence in Education?" *Journal of Educational Thought* 24:39-51.
Scheerens, J. 2000. *Improving School Effectiveness*. Paris: UNESCO.
Sen, A. 1999. *Development as Freedom*. New York: Anchor Books.
Sheffield, J. 1973. *Education in Kenya: An Historical Study*. New York: Teachers College Press.
Simmons, J. and L. Alexander. 1978. "The Determinants of School Achievement in Developing Countries: A Review of Research." *Economic Development and Cultural Change* 26:341-357.
Slavin, R.E. 1989. "Achievement effects of substantial reduction in class size." in *School and Classroom Organization*, edited by R. E. Slavin. Hillsdale, New Jersey: Erlbaum.
Smith, S.S. and R.G. Dixon. 1995. "Literacy Concepts of Low and Middle-Class Four-Year-Olds Entering Preschool." *Journal of Educational Research* 88:243-253.
Smith, W.J. and C. Lushaus. 1995. "The Nexus of Equality and Quality in Education: A Framework for Debate." *Canadian Journal of Education* 20:378-391.
Snijders, T.A.B. and R.J. Bosker. 1999. *Multilevel Analysis. An Introduction to Basic and Advanced Multilevel Modeling*. London, Thousand Oaks, New Delhi: Sage Publications.
Snow, C.E., W.S. Barnes, J. Chandler, I.F. Goodman, and L. Hemphill. 1991. *Unfulfilled Expectations: Home and School Influences on Literacy*. Cambridge, Massachusetts: Harvard University Press.
Spielhagen, F.R. 2006. "How Tweens View Single-Sex Classes." *Educational Leadership* 63:68-79, 71-72.
Stasavage, D. 2005. "Democracy and Primary School Attendance: Aggregate and Individual Level Evidence from Africa." *Afrobarometer Working Paper*.

Suzuki, I. 2002. "Parental Participation and Accountability in Primary Schools in Uganda." *Compare* 32:244-259.
Teddlie, C., D. Reynolds, and P. Sammons. 2001. "The Methodology and Scientific Properties of School Effectiveness." in *The International Handbook of School Effectiveness*, edited by C. Teddlie and D. Reynolds. London and New York: Routledge, Falmer.
Torney-Purta, J. 1990. "International Comparative Research in Education: Its Role in Educational Improvement in the U.S." *Educational Researcher* 19:32-35.
U.S. Department of Education. 2004. "No Child Left Behind. A Toolkit for Teachers." Department of Education, Washington D.C.
Uganda Bureau of Statistics. 2001. "Uganda DHS EdData Survey 2001." Uganda Bureau of Statistics, Entebbe.
UNDP. 2002. *Human Development Report 2002 - Deepening Democracy in a Fragmented World*. New York/Oxford: Oxford University Press.
UNESCO. 1999. *UNESCO Statistical Yearbook*. Paris: UNESCO Publishing and Bernham Press.
—. 2000. *Education for all. Status and trends in 2000. Assessing learning achievement*. Paris: UNESCO.
—. 2005a. "EFA Global Monitoring Report 2005." UNESCO, Paris.
—. 2005b. *UNESCO Statistical Yearbook Forty-Ninth Issue*. Paris: UNESCO.
—. 2006. "EFA Global Monitoring Report 2006." UNESCO, Paris.
Urch, G.E.F. 1992. *Education in Sub-Saharan Africa. A Source Book*. New York & London: Garland Publishing.
van Steensel, R. 2006. "Relations between Socio-Cultural Factors, the Home Literacy Environment and Children's Literacy Development in the First Years of Primary Education." *Journal of Research in Reading* 29:367-382.
Vegas, E. and I. Umansky. 2005. "Improving Teaching and Learning through Effective Incentives." in *Incentives to Improve Teaching. Lessons from Latin America*, edited by E. Vegas. Washington D.C.: World Bank.
Velez, E., E. Schiefelbein, and J. Valenzuela. 1993. "Factors Affecting Achievement in Primary Education." World Bank, Washington D.C.
VSO. 2002. "What makes teachers tick? A policy research report on teachers' motivation in developing countries." Volunteer Service Overseas, London.
Warwick, D.P. and H. Jatoi. 1994. "Teacher Gender and Student Achievement in Pakistan." *Comparative Education Review* 38:377-400.
Wedgwood, R. 2007. "Education and poverty reduction in Tanzania." *International Journal of Educational Development* 27:383-396.
West, A., P. Noden, A. Edge, and M. David. 1998. "Parental Involvement in and out of School." *British Educational Research Journal* 24:461-484.
West, A. and H. Pennell. 2002. "How new is New Labour? The quasi-market and English Schools 1997-2001." *British Journal of Educational Studies* 50:206-224.
Westbury, M. 1994. "The Effect of Elementary Grade Retention on Subsequent School Achievement and Ability." *Canadian Journal of Education* 19:241-250.
White, K.R. 1982. "The Relation Between Socioeconomic Status and Academic Achievement." *Psychological Bulletin* 91:461-481.
Willms, J.D. 2004. "Literacy proficiency of youth: evidence of converging socioeconomic gradients." *International Journal of Educational Research* 39:246-252.
Willms, J.D. and M. Somers. 2001. "Family, Classroom, and School Effects on Children's Educational Outcomes in Latin America." *School Effectiveness and School Improvement* 12:409-445.

Wolff, L. 1970. "Why Children Fail in First Grade in Rio Grande do Sul: Implications for Policy and Research." United States Agency for International Development, Rio de Janeiro.

Word, E., J. Johnston, Bain. H., B.D. Fulton, J. Zaharias, N. Lintz, C.M. Achilles, J. Folger, and C. Breda. 1990. "Student/Teacher Achievement Ratio (STAR): Tennessee's K-3 Class Size Study. Final Report and Summary." Tennessee State Department of Education, Nashville.

World Bank. 2002. "Achieving Universal Primary Education in Uganda: The 'Big Bang' Approach." Human Development Network, Washington, D.C.

—. 2006. "From Schooling Access to Learning Outcomes: An Unfinished Agenda. An Evaluation of World Bank Support for Primary Education." World Bank, Washington D.C.

Wößmann, L. 2000. "Schooling Resources, Educational Institutions, and Student Performance: The International Evidence." Kiel Institute of World Economics, Kiel.

—. 2005. "Educational Production in East Asia: The Impact of Family Background and Schooling Policies on Student Performance." *German Economic Review* 6:331-353.

Wößmann, L. and T. Fuchs. 2005. "Families, Schools, and Primary-School Learning: Evidence for Argentina and Columbia in an International Perspective." *World Bank Policy Research Paper* 3537.

Wright, S.P., S.P. Horn, and W.L. Sanders. 1997. "Teacher and Classroom Context Effects on Student Acheivement: Implications for Teacher Evaluation." *Journal of Personnel Evaluation in Education* 11:57-67.

Xu, J. and L. Corno. 2003. "Family Help and Homework Management Reported by Middle School Students." *The Elementary School Journal* 103:504-517.